



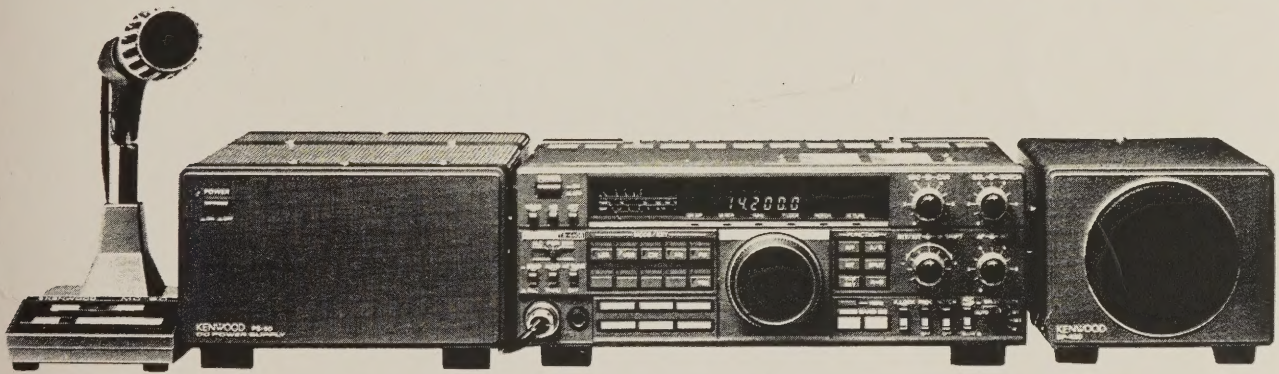


# KENWOOD

# SERVICE MANUAL

**TS-440S** PS-50, PS-430, SP-430, MB-430, VS-1  
AT-440, YK-88C/CN, YK-88S/SN

## HF TRANSCEIVER



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## SPECIFICATIONS

### (GENERAL)

Transmitter frequency range:

160m BAND 1.8 ~ 2.0MHz  
 80m BAND 3.5 ~ 4.0MHz  
 40m BAND 7.0 ~ 7.3MHz  
 30m BAND 10.1 ~ 10.15MHz  
 20m BAND 14.0 ~ 14.35MHz  
 17m BAND 18.068 ~ 18.168MHz  
 15m BAND 21.0 ~ 21.45MHz  
 12m BAND 24.89 ~ 24.99MHz  
 10m BAND 28.0 ~ 29.7MHz

Receive frequency range:

100kHz ~ 30MHz

Mode:

A1(CW), A3J(SSB), A3(AM), F1(FSK), F3(FM)

Antenna impedance:

50 Ohm (TX: 20 ~ 150 Ohm with AT)

Power requirement:

12.0 ~ 16.0V DC

Power consumption:

RX no signal input:

Approx. 1.9A

TX:

Approx. 20A

Frequency configuration:

RX unit:

1st IF 45.05MHz, 2nd IF 8.83MHz, 3rd IF 455kHz

TX unit: (A1,A3J,A3,FSK)  
(F3)

1st IF 455kHz, 2nd IF 8.83MHz, 3rd IF 45.05MHz

1st IF 36.22MHz, 2nd IF 45.05MHz

CW, SSB, AM, FSK, FM: Triple conversion superheterodyne

FM: Double conversion superheterodyne

Semiconductors:

|        | TS-440S | TS-440S (with AT) |
|--------|---------|-------------------|
| Tr's   | 157     | 174               |
| FET's  | 22      | 22                |
| IC's   | 49      | 58                |
| Diod's | 257     | 277               |

Dimensions:

|            | TS-440S   | TS-440S (with AT) |
|------------|-----------|-------------------|
| W(mm)      | 270 (279) | 270 (279)         |
| H(mm)      | 96 (108)  | 96 (108)          |
| D(mm)      | 313 (335) | 313 (335)         |
| Weight(kg) | 6.3       | 7.3               |

The numbers in the parenthesis include protections.

### (TRANSMITTER)

Rated final power input:

| Band \ Mode  | A1, A3, F1, F3 | A3        |
|--------------|----------------|-----------|
| 1.8 ~ 28 MHz | 200 W PEP      | 110 W PEP |

Carrier suppression:

More than 40dB

Unwanted sideband suppression:

More than 50dB

Harmonic content:

Less than -40dB

Transmit frequency character:

400 ~ 2600Hz (-6dB)

Maximum frequency deviation (FM):

±5kHz

Microphone impedance:

500Ω ~ 50kΩ

## SPECIFICATIONS

## (RECEIVER)

## Sensitivity:

| Mode \ Freq.         | 100 ~ 150kHz                       | 150 ~ 500kHz                       | 0.5 ~ 1.6MHz                       | 1.6 ~ 30MHz                           |
|----------------------|------------------------------------|------------------------------------|------------------------------------|---------------------------------------|
| SSB,CW,FSK (S/N10dB) | Less than 2.5 $\mu$ V (8dB $\mu$ ) | Less than 1 $\mu$ V (0dB $\mu$ )   | Less than 4 $\mu$ V (12dB $\mu$ )  | Less than 0.25 $\mu$ V (-12dB $\mu$ ) |
| AM (S/N10dB)         | Less than 25 $\mu$ V (28dB $\mu$ ) | Less than 13 $\mu$ V (22dB $\mu$ ) | Less than 40 $\mu$ V (32dB $\mu$ ) | Less than 2.5 $\mu$ V (8dB $\mu$ )    |
| FM (12dB SINAD)      | —                                  | —                                  | —                                  | Less than 0.7 $\mu$ V (-3 dB $\mu$ )  |

## Squelch sensitivity: (Threshold)

| Mode \ Freq.  | 100 ~ 150kHz                       | 150 ~ 500kHz                       | 0.5 ~ 1.6MHz                       | 1.6 ~ 30MHz                           |
|---------------|------------------------------------|------------------------------------|------------------------------------|---------------------------------------|
| SSB,CW,AM,FSK | Less than 20 $\mu$ V (26dB $\mu$ ) | Less than 10 $\mu$ V (20dB $\mu$ ) | Less than 20 $\mu$ V (26dB $\mu$ ) | Less than 2 $\mu$ V (6dB $\mu$ )      |
| FM            | —                                  | —                                  | —                                  | Less than 0.32 $\mu$ V (-10dB $\mu$ ) |

## Image ratio:

50dB or more (100kHz ~ 1.6MHz)

70dB or more (1.6 ~ 30MHz)

## IF rejection:

50dB or more (FM 3rd image ratio)

50dB or more (100kHz ~ 1.6MHz)

70dB or more (1.6MHz ~ 30MHz)

## Selectivity:

| Mode \ Freq. | -6dB            | -60dB                   |
|--------------|-----------------|-------------------------|
| SB,CW,FSK    | More than 2kHz  | Less than 4.4kHz        |
| AM           | More than 4kHz  | Less than 18kHz (-50dB) |
| FM           | More than 12kHz | Less than 25kHz (-50dB) |

## IF SHIFT variable range:

 $\pm 0.9$ kHz or more

## RIT/XIT variable range:

 $\pm 1$ kHz or more

## Audio output power:

1.5W or more (with 8 $\Omega$  load, 10% distortion)

## Audio output impedance

4 ~ 16 $\Omega$  (Speaker and headphone)

## (FREQUENCY STABILITY)

## Frequency accuracy: (RIT/XIT OFF)

More than  $\pm 10 \times 10^{-6}$ 

## Frequency stability:

More than  $\pm 10 \times 10^{-6}$  (-10°C to 50°C)

## (RIT/XIT OFF: at receive)

## Reference oscillator frequency:

36MHz

**Note:** Circuit and ratings subject to change without notice due to developments in technology.

## CIRCUIT DESCRIPTION

### 1. Overview

- The TS-440 is a triple conversion type transceiver, incorporating a general coverage receiver, which uses 45.05 MHz as the first IF, 8.83 MHz as the second IF, and 455 kHz as the third IF.
- The TS-440 is compact, but allows for installation of an optional internal automatic antenna tuner operating in the amateur band from 3.5 MHz to 28 MHz and enables a wide range of antennas to be used.
- The TS-440 also contains a microprocessor-controlled digital PLL circuit which controls frequency in 10 Hz steps using a single crystal oscillator to implement high accuracy and stable frequency control.
- The TS-440 has the following major features:
  - (1) Selectable VFOs; VFO-A and VFO-B
  - (2) Direct frequency input using a numeric keypad
  - (3) 100-channel memory containing frequency band, and mode information (channel 90 to 99 for split fre-

- quency memory)
- (4) Memory scan in 10 channel groups and two types of program scan
- (5) RTTY (AFSK) mode available
- (6) Squelch circuit operational in all modes
- (7) Dual filters available to improve selectivity and S/N ratio (optional filter required)
- (8) IF shift, audio notch, IF filter switching, and RF ATT functions for convenient interference reduction
- (9) Large heat sink and cooling fan (100 W) enabling up to one-hour continuous transmit operation
- (10) Full and semi break-in circuits for CW
- (11) External-computer controllable (optional interface required)
- (12) Many easy-to-read meter functions such as the received signal strength (s-meter), transmitter power, SWR, and ALC level.

### 2. Frequency Elements

The TS-440 utilizes a triple conversion transmitter and receiver.

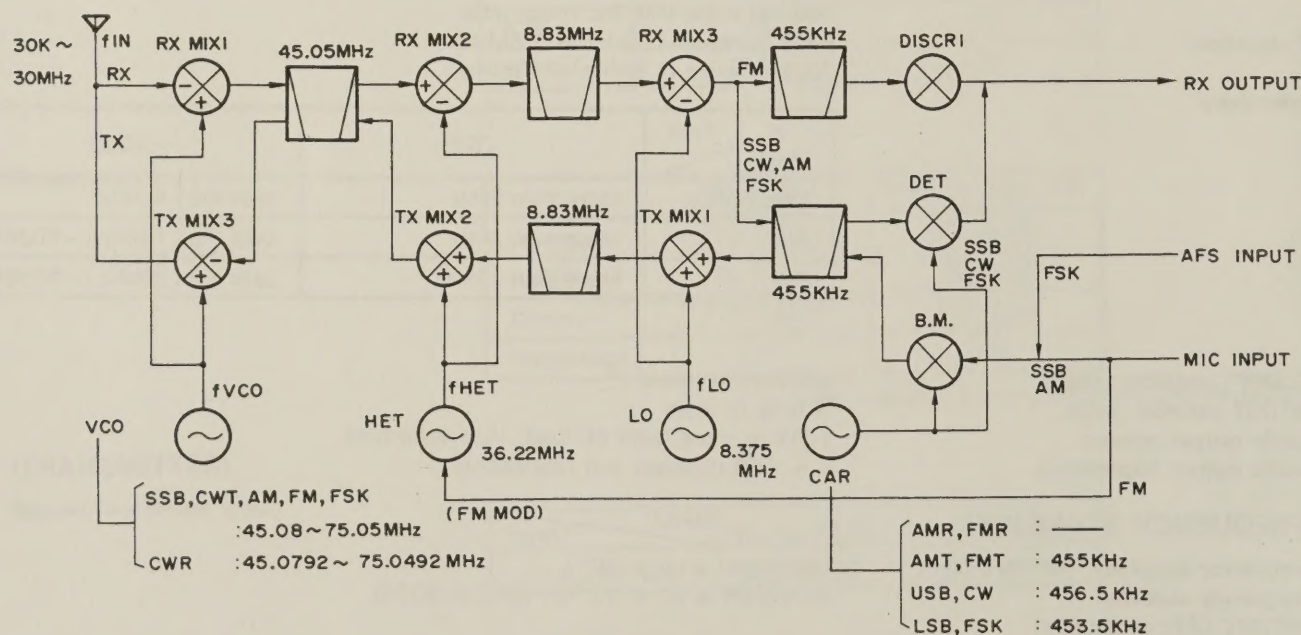


Fig. 1 Frequency configuration

The overall frequency configuration of the TS-440 is shown in Figure 1. The incoming received signal (f<sub>IN</sub>) is applied to the ANT terminal. This signal is mixed with the local oscillator signal (f<sub>VCO</sub>) in RX MIX 1 to obtain the first IF frequency. This signal is then mixed with the HET Oscillator signal (f<sub>HET</sub>) in RX MIX 2, to obtain the 2nd IF frequency. The resulting signal is then mixed with the second local oscilla-

tor frequency (f<sub>LO</sub>) to obtain the 3rd IF frequency. The signal is then combined with the CAR signal for detection. f<sub>IN</sub> is expressed mathematically as follows:

$$f_{IN} = f_{VCO} - f_{HET} - f_{LO} - f_{CAR} \dots\dots\dots 1$$



## CIRCUIT DESCRIPTION

$$I = 1800, J = 7244, K = 19800, L = 3239, M = 41$$

$$\therefore f_{IN} = 0.388 f_{STD} \dots\dots\dots 11$$

When  $f_{IN} = 30$  MHz (USB mode) in formula 10,  $f_{IN}$  and  $f_{STD}$  have the following relationship:

$$I = 1800, J = 7244, K = 19800, L = 3239, M = 73$$

$$\therefore f_{IN} = 0.833 f_{STD} \dots\dots\dots 12$$

Since the precision of the reference crystal oscillator used in the TS-440 is 10 ppm (– 10 to 50°C) and the receiver system has the characteristics shown in items i) and ii), the total accuracy is stable at any point from 30 kHz to 30 MHz. The maximum amount of frequency shift is only  $\pm 300$  Hz (see formula 12). The characteristic shown in item iii) enables variable band functions such as IF shift to be implemented, using the microprocessor. The microprocessor also is used to set carrier points by adjusting  $f_{CAR}$ , and to set and adjust the amount of IF shift.

So far received frequencies in the SSB mode have been dis-

cussed. For receive modes other than SSB, and in transmit mode, operating frequency is determined by the reference frequency and frequency division data.

In CW receive mode,  $f_{VCO}$  is shifted down 800 Hz and used as  $f_{VCO3}$ . In AM or FM receive mode,  $f_{CAR}$  generation is stopped. In FM receive mode,  $f_{HET}$  is modulated by adding audio signals to VCO5 from the microphone. FSK (RTTY) is transmitted in LSB mode and uses AFSK by adding audio signals externally.

The type of frequency displayed differs, depending on the mode, as shown in Table 1.

| Mode          | Displayed frequency            |
|---------------|--------------------------------|
| USB, LSB, FSK | Carrier point frequency        |
| CW            | Transmission carrier frequency |
| AM, FM        | IF filter center frequency     |

Table 1 Displayed frequencies

### 3. Receiver Circuit Description

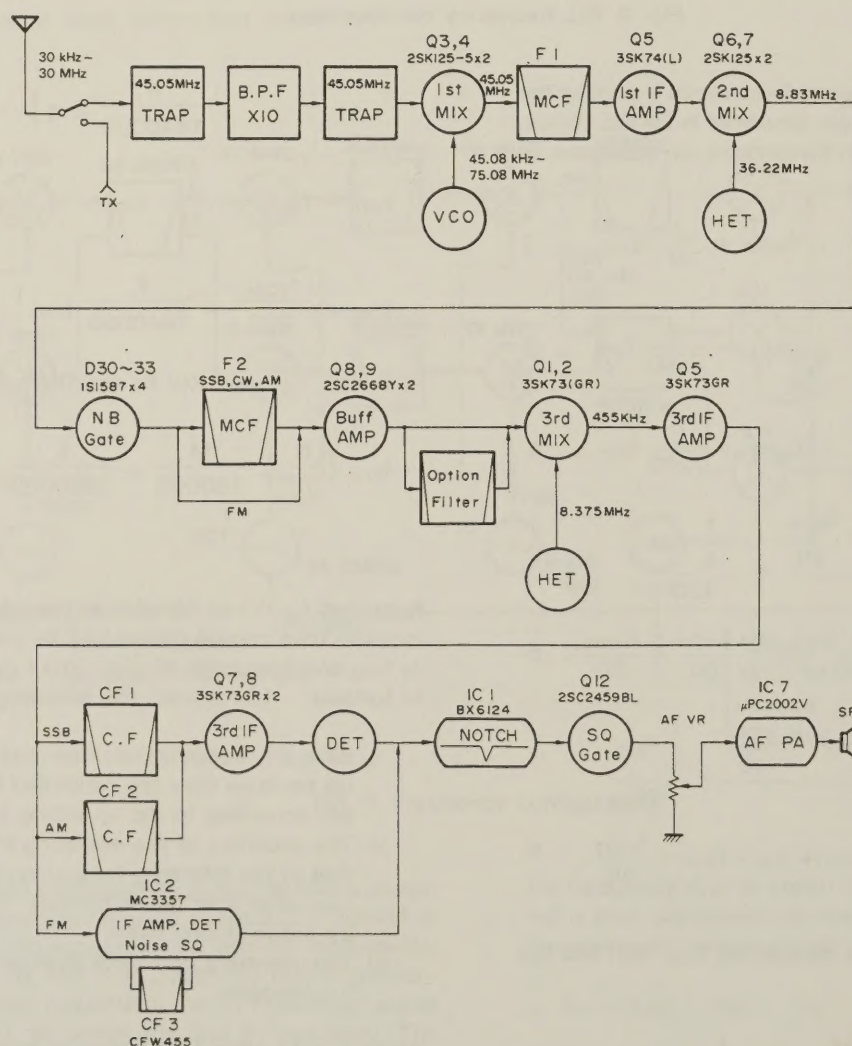


Fig. 3 Receiver circuit configuration

## CIRCUIT DESCRIPTION

Signals from the ANT pin are fed into the RAT pin of the RF unit via the transmit/receive switching relay. The signals then go to the 10 BPFs through the approx. 20 dB attenuator circuit, the first stage of the first IF trap circuit, and the low pass filters (which pass only 500 kHz or less). The signal then goes through the second stage of the first IF trap circuit, and is mixed with the VCO signal and converted into the first IF signal of 45.05 MHz in the first mixer, consisting of Q3 and Q4 (2SK125-5). The VCO circuit consists of Q21 to Q24 (2SC2668Y) and oscillates in four bands from 45.05 MHz to 75.05 MHz. Oscillator frequencies are controlled by DC signals from the PLL unit.

The first IF signal of 45.05 MHz is passed through the MCF (F1), which is used in both receive and transmit, and is amplified by the first IF amplifier Q5 (3SK74L). In the second mixer, consisting of Q6 and Q7 (2SK125), the first IF signal is mixed with the heterodyne oscillator signal (36.22 MHz) from the PLL circuit, amplified by Q12 (2SC2668Y) to obtain the second IF signal (8.83 MHz). The second IF signal of 8.83 MHz goes through the gate of the noise blanker. In modes other than FM, the signal then goes through the MCF (F2) and is fed into the IF unit through buffer amplifiers Q8 and Q9 (2SC2668Y).

### 1) Selectivity circuit

Figure 4 is a selectivity circuit diagram. In auto mode, the appropriate bandwidth filter is automatically selected according to mode. When an optional filter is used, two filters are available. Tables 2 and 3 shows the various combinations

When the optional 8.83 MHz filter is connected, the second IF signal is then fed from the IF unit into the optional filter. In the third mixer, consisting of Q1 and Q2 (3SK73GR), the second IF signal is mixed with 8.375 MHz signal generated by IF unit's heterodyne oscillator circuit, consisting of Q53 and Q54 (2SC2458Y), and converted into the third IF signal (455 kHz). The third IF signal is then amplified by Q5 (3SK73GR). A diode switch is used to route the signal to either the FM or SSB circuits.

In SSB mode, the third IF signal goes through the SSB ceramic filter (XF3). In AM mode, the third IF signal goes through the AM ceramic filter (XF4). In either mode, the third IF signal is then amplified by Q7 and Q8 (3SK73GR) and detected. In FM mode, the third IF signal goes through the FM ceramic filter (XF5). The signal is then sent to the FM IF, IC2 (MC 3357) for amplification and detection. IC2 also contains an FM noise squelch circuit.

The detected SSB/AM signal is passed through the notch circuit, consisting of hybrid IC IC1 (BX6124) and squelch gate Q12 (2SC2459BL). The signal then goes through the AF volume control and is amplified to the appropriate level by AF amplifier IC7 (UPC2002V).

of bandwidth available when optional filters are used. In FM mode, the selectivity switch does not operate and a single dedicated FM filter is used. Optional filters operate only in receive and are separate from the filters used in transmit.

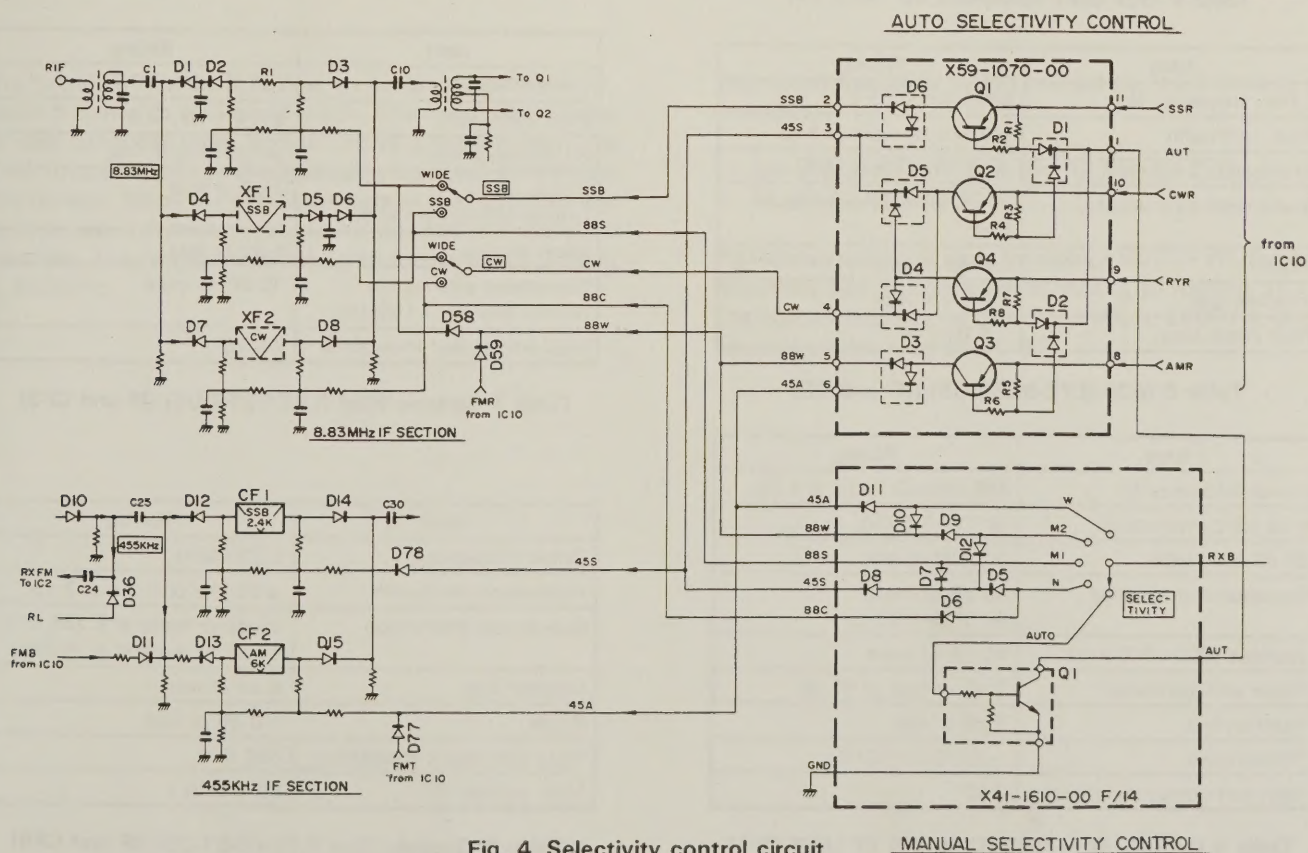


**Fig. 4 Selectivity control circuit**

## CIRCUIT DESCRIPTION

### Filter selective

#### AUTO MODE

| MODE | WITHOUT OPTION |        | OPTION INSTALLED |        |
|------|----------------|--------|------------------|--------|
|      | 8.83MHz        | 455kHz | 8.83MHz          | 455kHz |
| SSB  | Through        | CF1    | XF1              | CF1    |
| CW   | Through        | CF1    | XF2              | CF1    |
| AM   | Through        | CF2    | Through          | CF2    |
| FSK  | Through        | CF1    | XF2              | CF1    |
| FM   | Through        | —      | Through          | —      |

XF1: YK-88S or YK-88SN

XF2: YK-88C or YK-88CN

Table 2

| Item                       | Rating                                           |
|----------------------------|--------------------------------------------------|
| Center frequency $f_0$     | 45.05 MHz                                        |
| Center frequency deviation | $f_0 \pm 1$ kHz at 3 dB                          |
| Pass bandwidth             | $\pm 9.6$ kHz or more at 3 dB                    |
| Attenuation bandwidth      | $\pm 28$ kHz or less at 10 dB                    |
| Ripple                     | 0.7 dB or less                                   |
| Insertion loss             | 2.0 dB or less                                   |
| Guaranteed attenuation     | 30 dB or more with $\pm 1$ MHz (Except spurious) |
| Final impedance            | $2 \text{ k}\Omega \pm 10 \%$ /L characteristic  |

Table 4 MCF (L71-0259-05) (RF UNIT F1)

| Item                   | Rating                                 |
|------------------------|----------------------------------------|
| Center frequency $f_0$ | $8830 \text{ kHz} \pm 0.5 \text{ kHz}$ |
| Pass bandwidth         | $\pm 3$ kHz or more at 3 dB            |
| Attenuation bandwidth  | $\pm 12$ kHz or less at 18 dB          |
| Guaranteed attenuation | 30 dB or more within $f_0 \pm 1$ MHz   |
| Ripple                 | 0.5 dB or less                         |
| Insertion loss         | 1.0 dB or less                         |
| Final impedance        | $2.5 \text{ k}\Omega / 3 \text{ pF}$   |

Table 6 MCF (L72-0260-05) (RF unit F2)

| Item                       | Rating                                        |
|----------------------------|-----------------------------------------------|
| Center frequency $f_0$     | $455 \text{ kHz} \pm 0.2 \text{ kHz}$ at 6 dB |
| 6 dB bandwidth (total)     | $\pm 1.1 \sim 1.3$ kHz                        |
| 60 dB bandwidth            | 4.5 kHz or less                               |
| Guaranteed attenuation     | 60 dB or more (at $0.1 \sim 1$ MHz)           |
| Spurious (600 ~ 700 kHz)   | 40 dB or more                                 |
| Ripple with bandwidth      | 2 dB or less at 60 dB                         |
| Insertion loss             | 2 dB or less                                  |
| Temperature                | $-10^\circ\text{C} \sim +50^\circ\text{C}$    |
| Input and output impedance | $2 \text{ k}\Omega$                           |

Table 8 Ceramic filter (L72-0356-05) (IF UNIT CF1)

#### MANUAL MODE

| SELECT | WITHOUT OPTION |        | OPTION INSTALLED |        |
|--------|----------------|--------|------------------|--------|
|        | 8.83MHz        | 455kHz | 8.83MHz          | 455kHz |
| N      | NO RX          |        | XF2              | CF1    |
| M1     |                |        | XF1              | CF1    |
| M2     | Through        | CF1    | Through          | CF1    |
| W      | Through        | CF2    | Through          | CF2    |

XF1: YK-88S or YK-88SN

XF2: YK-88C or YK-88CN

Table 3

| Item                                                                   | Rating                |
|------------------------------------------------------------------------|-----------------------|
| Center frequency $f_0$                                                 | 455 kHz               |
| 6 dB bandwidth                                                         | $\pm 2$ kHz or more   |
| 40 dB bandwidth                                                        | 7.5 kHz or less       |
| Insertion loss                                                         | 6 dB or less          |
| Guaranteed attenuation (within $455 \text{ kHz} \pm 100 \text{ kHz}$ ) | 35 dB or more         |
| Input and output impedance                                             | $2.0 \text{ k}\Omega$ |

Table 5 Ceramic filter (L72-0355-05) (IF UNIT CF2)

| Item                                                                   | Rating                              |
|------------------------------------------------------------------------|-------------------------------------|
| Center frequency $f_0$                                                 | $455 \text{ kHz} \pm 1 \text{ kHz}$ |
| 6 dB bandwidth                                                         | $\pm 6$ kHz or more                 |
| 50 dB bandwidth                                                        | $\pm 12.5$ kHz or less              |
| Ripple (within $455 \text{ kHz} \pm 4 \text{ kHz}$ )                   | 3 dB or less                        |
| Insertion loss                                                         | 6 dB or less                        |
| Guaranteed attenuation (within $455 \text{ kHz} \pm 100 \text{ kHz}$ ) | 35 dB or more                       |
| Input and output impedance                                             | $2.0 \text{ k}\Omega$               |

Table 7 Ceramic filter (L72-0315-05) (IF unit CF3)

| Item                       | Rating                                                  |
|----------------------------|---------------------------------------------------------|
| Center frequency $f_0$     | 8.830 MHz                                               |
| Attenuation bandwidth      | $\pm 50$ kHz or more at 3 dB                            |
| Guaranteed attenuation     | 35 dB or more at 9.285 MHz<br>45 dB or more at 9.74 MHz |
| Insertion loss             | 6 dB or less                                            |
| Ripple                     | 1.0 dB or less                                          |
| Input and output impedance | $330 \Omega$                                            |
| Max. voltage (DC)          | 50 V (Min.)                                             |

Table 9 Ceramic filter (L72-0351-05) (IF unit CF4)

## CIRCUIT DESCRIPTION

## 2) AF notch circuit

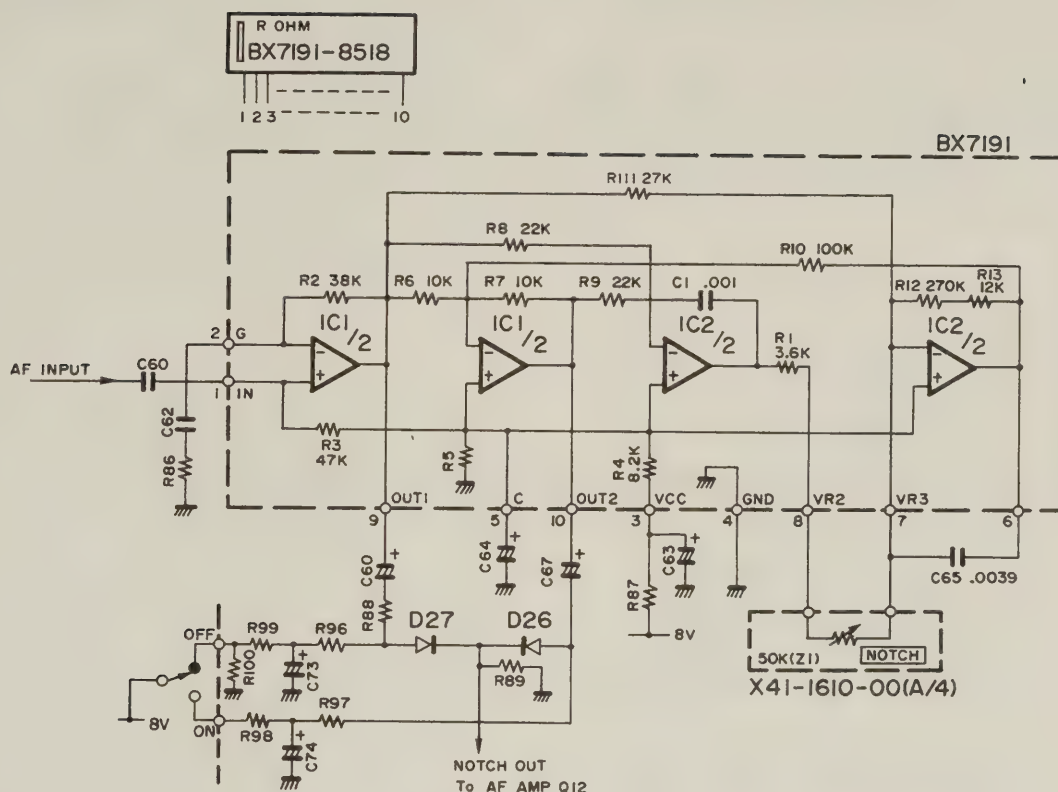


Fig. 5 NOTCH circuit

The hybrid IC1 in the IF unit is an audio notch circuit. Figure 5 shows its equivalent circuit. This circuit forms state-variable bandpass filter, also known as a bi-quad filter. The notch frequency can be changed using the notch control variable resistor. Since the circuit consists of the hybrid IC, stable attenuation characteristics can be obtained electrically and thermally. The range of variable notch frequencies is 400 Hz to 2600 Hz.

The notch frequency is determined by the following two formulas.

- 1)  $f_N \div \sqrt{R6/2\pi \cdot (R1 + \text{Notch VR}) \cdot R8 \cdot R10 \cdot C1 \cdot C65} \dots\dots\dots 1$
- 2)  $R6 \cdot (R12 + R13) \div R10 \cdot R11 \dots\dots\dots 2$

If a variable resistor is used for resistor NOTCH VR, the notch frequency can be controlled according to formula 1). The notch frequency range is from 400 to 2600 Hz, and attenuation is from 25 to 50 dB.

## CIRCUIT DESCRIPTION

## 3. Transmitter Circuit Description

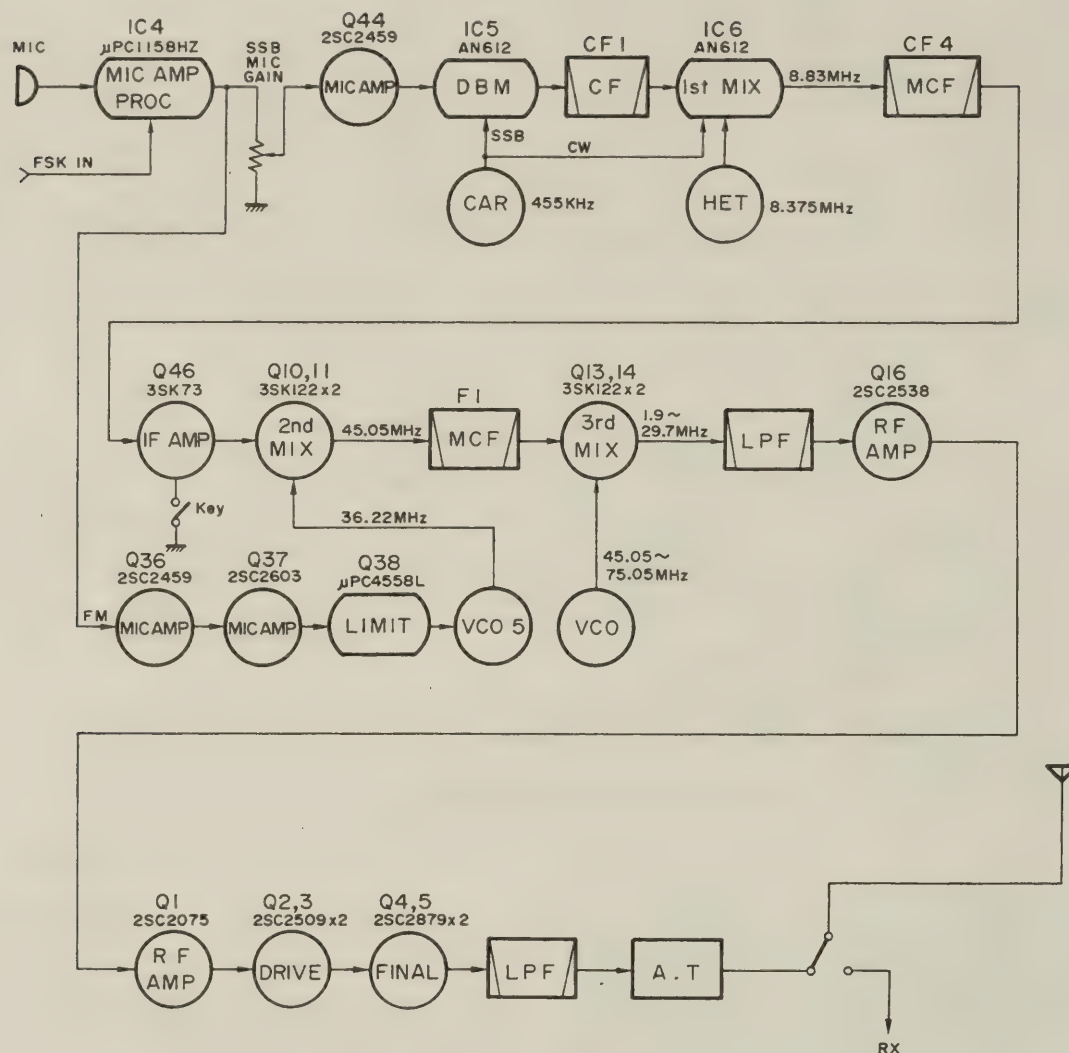


Fig. 6 Transmitter circuit configuration

In SSB, CW, AM, or FSK mode, the transmitter system uses triple conversion. In FM mode, the transmitter system uses double conversion using PLL modulation.

Audio signals from the microphone are applied to the MIC pin (connector (21)) of the IF unit and are separated into SSB modulation and VOX signals. The SSB signal is amplified approx. 8 dB by IC4 (μPC1158HZ). AFSK audio signals from the AFSK IN pin (back panel) are also applied to IC4.

IC4 functions as a SPEECH processor. Output from IC4 is distributed to the MIC GAIN control (front panel) and FM circuit (RF unit). In SSB mode, the signal applied to the MIC GAIN control is sent back to the IF unit (connector (23) MV2), amplified by Q44 (2SC2459), and supplied to the balanced modulator IC5 (AN612). In FM or CW mode, Q44 does not operate because a cut-off voltage is supplied to its emitter via diodes D82 and D46. The signal converted to 455 kHz

## CIRCUIT DESCRIPTION

DSB by IC4 goes through the SSB transmit switching diodes D17 and D18, filter switching diodes D14 and D12, and SSB ceramic filter CF1, to obtain the SSB signal. The SSB signal then goes through the transmit switching diode D36 and is fed into the transmit first mixer, IC6, where the SSB signal is mixed with the output from the 8.375 MHz oscillator in the IF unit, and converted to 8.83 MHz. In CW or FM mode, the carrier signal from the PLL unit does not go through IC5 BM or the 455 kHz filter. These carrier signals are applied to IC6 via switching diodes D53 and D54. The output signal from IC6 goes through the MCF to remove spurious components, and is amplified by the IF amplifier Q46 (3SK73) and sent to the RF unit. Q46 provides ALC control and CW keying.

In the transmitter second mixer, consisting of Q11 and Q12, (3SK122), the 8.83 MHz transmit IF signal input to the RF unit is mixed with HET oscillator signal (36.22 MHz) from the PLL unit and converted to 45.05 MHz signals. The 45.05 MHz signal goes through D23 and the MCF to remove any spurious components. The 45.05 MHz signal then goes through D27 and is supplied to the transmit third mixer consisting of Q13 and Q14 (3SK122). In the third mixer the signal is mixed with VCO signal (Q21 to Q24) amplified by Q12 (2SC2668) and converted to the required transmit frequency (1.8 to 29.7 MHz). The signal from the third mixer goes through the low pass filters C156, C158, C159, and L89, and is amplified by the wide band amplifier Q15 (2SC2570). The signal then goes through the wide band transformer T19 and low pass filters C164, C165, and L90, and is further amplified by wide band amplifier Q16 (2SC2538). The signal from the Q16 goes through the output transformer T20 and is used as the drive output.

In FM mode, the PLL VCO is directly modulated. The audio signal from IF unit IC4 (UPC1158HZ) is fed into the RF unit via the FMI pin. In the RF unit, the audio signal is amplified by Q36 (2SC2459) and Q37 (2SC2603), and goes through the limiter circuit consisting of Q38 (UPC4558C) and low pass filter circuit, and is sent to the PLL unit via the FMD pin. In the PLL unit, the 36.22 MHz VCO is modulated. Q39 (2SC2603) is a switching circuit to prevent the modulated signals from being emitted from the PLL unit in a mode other than FM.

For "S" model radios the output from the RF unit is amplified to a 100 W power level by Q1 (2SC2075), Q2 and Q3 (2SC2509), and Q4 and Q5 (2SC2879) in the final unit. The 100 W output goes through the LPFs which differ by bands, and is sent as output to the antenna via the AT unit and transmit/receive switching relay. SWR and ALC detection is performed at the output of the LPFs.

### 1) Antenna tuner

The antenna tuner operates when the AUTO/THRU switch is in the AUTO position and the AT TUNE switch is ON. The antenna tuner is driven in the CW mode and power is reduced to 50 W by the microcomputer regardless of the mode selected before the AT TUNE switch was turned ON. The range of operating frequencies is determined by a microcomputer program, and is from 3.5 MHz to 30 MHz.

#### • AT unit operation

Power transmitted by the final unit passes through the current and voltage detecting transformers L1 and L2 using toroidal cores. Current and voltage components detected by the transformers are supplied to pins 9 and 13 of IC2 for wave shaping and their phases are compared by IC3 HD10131. The output from pin 3 of IC3 depends upon the phase of the voltage and current waveforms applied to IC3. The signal from IC3 pin 3 is sent to pins 10 and 15 of buffer IC IC3 HD10125. Output from pins 12 and 13 of IC3 goes through level shift Zener diodes D5 and D6 to control the input circuit of motor drive IC IC5 BA6109U2. The output signal is used to drive motor M1 to adjust the variable capacitor VC1 so that the phase difference between voltage and current components is reduced.

The current and voltage components output from the current and voltage detecting transformers is also supplied to the voltage comparator IC1 NJM2903D. The comparator output is used by motor drive IC IC6 BA6109U2 to drive motor M2 to adjust variable capacitor VC2 so that the amplitude difference is reduced. That is, the phase control variable capacitor VC1 is controlled so that the current is in phase with the voltage and the voltage control variable capacitor VC2 is controlled so that the amount of amplitude difference between the current and voltage is reduced (SWR1, an SWR of 1 to 1, is obtained when the current and voltage are in phase and the amount of amplitude difference is 0). VC1 and VC2 are designed to operate independently of each other, but since phase difference affects the amount of amplitude difference and vice versa, VC1 and VC2 will normally rotate together.

Forward and reflected waves detected by the filter unit are converted to SWR control signals in the SWR arithmetic circuit in the control unit and are sent to the ISW pin of the AT unit. Since the SWR control signals are current waveforms, the signals are converted from I to V waveforms by IC8 (b/4) in the AT unit and to obtain the corresponding voltage mode SWR signals are generated. The SWR signals are then fed into the SWR comparator IC8 (C/4). The reference voltage pin 9 of the IC8 (C/4) is supplied with a voltage corresponding to an SWR of 1.25 to 1 via a potentiometer. Therefore, when the actual SWR value exceeds 1.25, pin 8 of SWR comparator IC8 (C/4) is H, so the motor drive voltage control transistor Q5 turns on and the collector of Q4 is supplied with voltage from pin 14S. The voltage is also used to turn the tuning LED on. The inverted input pin of IC8 (d/4) is supplied with triangular waves generated by IC7, and its non-inverted input pin is supplied with the above SWR voltage signals. As a result, as SWR lowers, IC8 (d/4) outputs

## CIRCUIT DESCRIPTION

waves changing from continuous waves to relatively low duty pulses. Q1 is driven by this voltage waveform to control Q2, which is connected to the collector of Q4 in series and motor drive voltage is generated.

If the motor turns too fast, the SWR value will be smaller than the motor stop value because of the inertia of the motor. As a result, the motor will continue to operate even if

the motor stop signal is sent and the SWR value will continue to be greater than the motor stop value, causing the motor stop signal to turn off. That is, the motor will not stop and it will be difficult to obtain a match. If the motor speed is too slow, it will take a long time to satisfy a matching condition. The TS-440 therefore controls the motor speed according to changes in SWR.

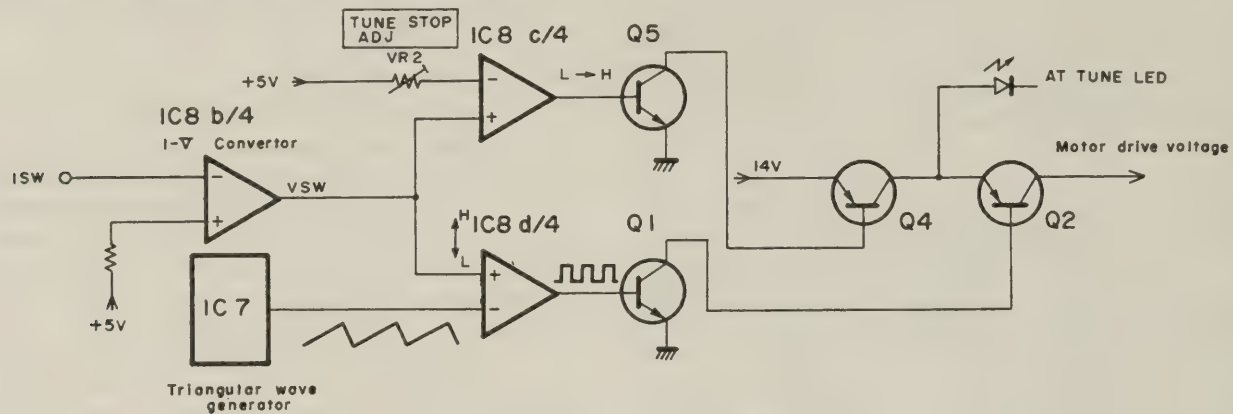


Fig. 7 Antenna tuner circuit

The antenna coupler is a T type. Six relays RL100 to RL105 are used to change taps within the range 3.5 MHz to 30 MHz.

### 2) Cooling fan circuit

The final unit contains the temperature-sensitive thermistor TH1 thermally coupled with final transistor Q4. When temperature on the surface of Q4 reaches approx. 50°C, the fan start comparator Q9B operates (H level), causing Q8 to turn on to operate the fan. During operation of the fan, temperature protection comparator Q9A is at a L level, so the temperature protection circuit does not operate. When temperature on the surface of Q4 goes down to 45°C, the cooling fan turns off.

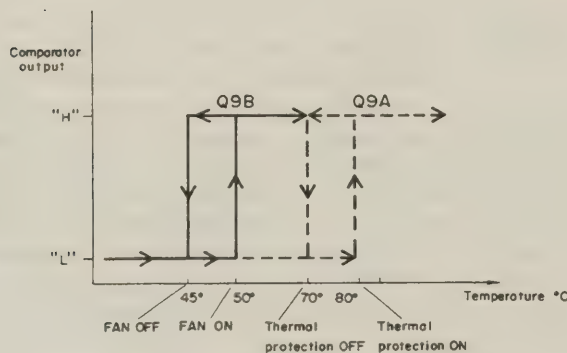


Fig. 8 temperature protection operation

#### • Final temperature protection circuit

When the temperature of the final transistor Q4 rises up to approx. 80°C, the temperature protection comparator Q9A turns on (H level), Q1 in the filter unit also turns on, and a minus DC voltage is supplied to the ALC line, reducing the transmitter output to zero. (The TS-440 does not return to a receive state.) When the temperature of the final transistor Q4 falls to approx. 70°C, the protection circuits turns off allowing the transmitter to operate again.

#### • SWR protection circuit

When antenna VSWR is bad, or the reflected wave is too large, because the auto antenna is tuning for example, L42 and L43 detect the state and its output is rectified. The rectified signal is then amplified by Q2 to control the ALC voltage so that drive power is reduced. As a result, load on the final unit is reduced.

#### • SWR automatic arithmetic circuit

The TS-440 uses the automatic arithmetic circuit in the AT-250. The forward wave voltage  $V_{SF}$  and reflected wave voltage  $V_{SR}$  from the filter unit are fed into the analog arithmetic circuit of the switch unit, and used to set the voltage level of IC8 pin 2 ( $5V + V_{SR}/V_{SF}$ ). Output voltage from the pin 2 is shifted by IC5 to move the needle in the SWR meter.

IC5 contains a level shift/meter amplifier and an auto tuner V-I converter. IC7 contains a square wave generator and a voltage comparator. IC8 contains an integration circuit. Q3 and Q4 are used to switch forward and reflected wave input signals alternately.

## CIRCUIT DESCRIPTION

$V_{SF}$  is compared with voltage from IC8 pin 6 (5.5 V). When SWR increases,  $V_{SF}$  lowers and the voltage level of IC8 pin 8 rises. At IC7 pin 3, a triangular wave is monitored. The triangular wave is compared with the wave input. The triangular wave is converted by IC10 and sent to switch Q3 used as the SWR control voltage.

Output voltage from IC8 pin 2 consists of the voltage compared with  $V_{SR}/V_{SF}$  and +5 DC voltage. It is distributed to IC4 the level shift/meter amplifier to move the needle in the SWR meter and IC5 the V-I converter to control the AT440.

VR14 is used to adjust the SWR meter ZERO point.

VR13 is for SWR meter adjustment

## K-IN and VOX circuits

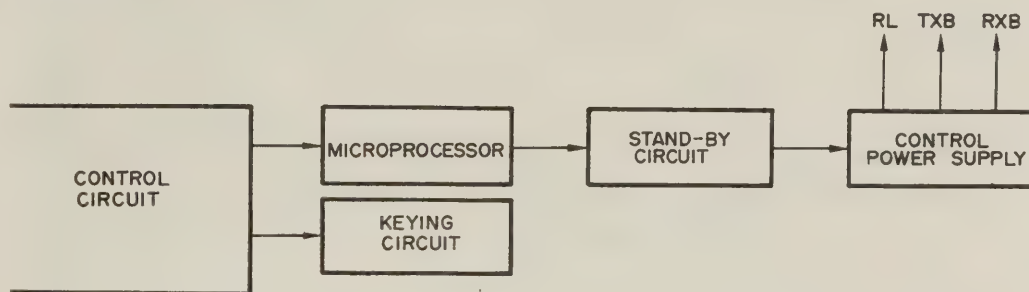


Fig. 9-1 FULL/SEMI BREAK-IN block diagram

When the key, or the VOX switching ground is applied to the input pin 1, the microprocessor determines if a valid transmit condition has been met. When that condition has been met, the

standby circuit in the IF unit will be turned on. A keying signal is generated by the control circuit, whenever the key is depressed, to control the keying circuits in the IF unit. This keying signal is also used as the transmit/receive signal during break-in operations.

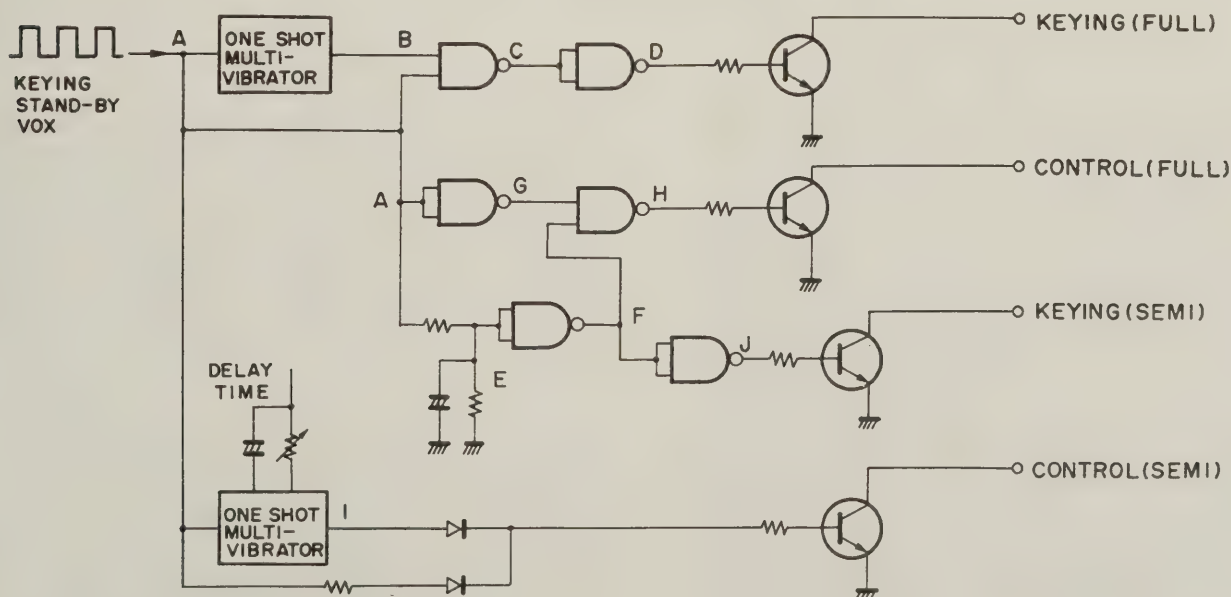


Fig. 9-2 FULL/SEMI BREAK-IN timing chart

## CIRCUIT DESCRIPTION

waves changing from continuous waves to relatively low duty pulses. Q1 is driven by this voltage waveform to control Q2, which is connected to the collector of Q4 in series and motor drive voltage is generated.

If the motor turns too fast, the SWR value will be smaller than the motor stop value because of the inertia of the motor. As a result, the motor will continue to operate even if

the motor stop signal is sent and the SWR value will continue to be greater than the motor stop value, causing the motor stop signal to turn off. That is, the motor will not stop and it will be difficult to obtain a match. If the motor speed is too slow, it will take a long time to satisfy a matching condition. The TS-440 therefore controls the motor speed according to changes in SWR.

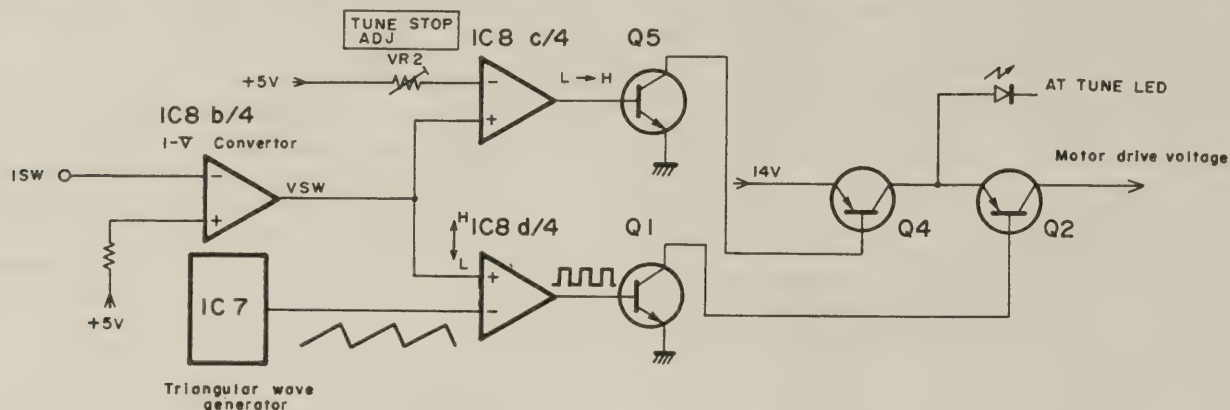


Fig. 7 Antenna tuner circuit

The antenna coupler is a T type. Six relays RL100 to RL105 are used to change taps within the range 3.5 MHz to 30 MHz.

### 2) Cooling fan circuit

The final unit contains the temperature-sensitive thermistor TH1 thermally coupled with final transistor Q4. When temperature on the surface of Q4 reaches approx. 50°C, the fan start comparator Q9B operates (H level), causing Q8 to turn on to operate the fan. During operation of the fan, temperature protection comparator Q9A is at a L level, so the temperature protection circuit does not operate.

When temperature on the surface of Q4 goes down to 45°C, the cooling fan turns off.

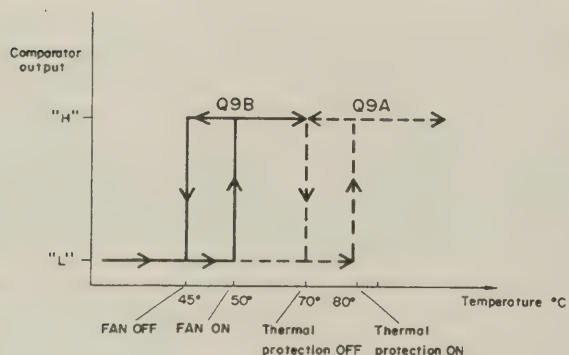


Fig. 8 temperature protection operation

#### • Final temperature protection circuit

When the temperature of the final transistor Q4 rises up to approx. 80°C, the temperature protection comparator Q9A turns on (H level), Q1 in the filter unit also turns on, and a minus DC voltage is supplied to the ALC line, reducing the transmitter output to zero. (The TS-440 does not return to a receive state.) When the temperature of the final transistor Q4 falls to approx. 70°C, the protection circuit turns off allowing the transmitter to operate again.

#### • SWR protection circuit

When antenna VSWR is bad, or the reflected wave is too large, because the auto antenna is tuning for example, L42 and L43 detect the state and its output is rectified. The rectified signal is then amplified by Q2 to control the ALC voltage so that drive power is reduced. As a result, load on the final unit is reduced.

#### • SWR automatic arithmetic circuit

The TS-440 uses the automatic arithmetic circuit in the AT-250. The forward wave voltage  $V_{SF}$  and reflected wave voltage  $V_{SR}$  from the filter unit are fed into the analog arithmetic circuit of the switch unit, and used to set the voltage level of IC8 pin 2 ( $5V + V_{SR}/V_{SF}$ ). Output voltage from the pin 2 is shifted by IC5 to move the needle in the SWR meter.

IC5 contains a level shift/meter amplifier and an auto tuner V-I converter. IC7 contains a square wave generator and a voltage comparator. IC8 contains an integration circuit. Q3 and Q4 are used to switch forward and reflected wave input signals alternately.

Final Amp  
potential  
CKT  $\frac{Q1}{Q1}$   
Is turned  
"on" and

A MINUS  
DC voltage  
is fed to  
the ACC  
line

?



## CIRCUIT DESCRIPTION

$V_{SF}$  is compared with voltage from IC8 pin 6 (5.5 V). When SWR increases,  $V_{SF}$  lowers and the voltage level of IC8 pin 8 rises. At IC7 pin 3, a triangular wave is monitored. The triangular wave is compared with the wave from IC8 pin 8 and output. The triangular wave is converted to a square wave by IC10 and sent to switch Q3 and Q4. This voltage is used as the SWR control voltage.

Output voltage from IC8 pin 2 consists of the voltage compared with  $V_{SR}/V_{SF}$  and +5 DC voltage. It is distributed to IC4 the level shift/meter amplifier to move the needle in the SWR meter and IC5 the V-I convertor to control the AT440.

VR14 is used to adjust the SWR meter ZERO point. VR13 is for SWR meter adjustment

### 3) FULL/SEMI BREAK-IN and VOX circuits

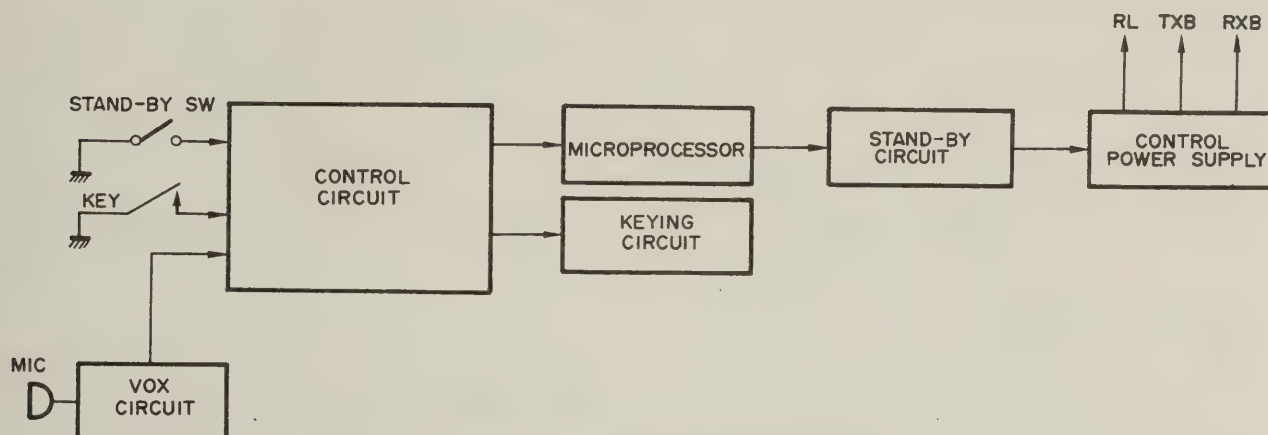


Fig. 9-1 FULL/SEMI BREAK-IN block diagram

When the standby switch, the key, or the VOX switching transistor are activated, a ground is applied to the input pin of the control circuit, which causes a standby signal to be fed to the microprocessor to determine if a valid transmit condition has been met. When that condition has been met, the

standby circuit in the IF unit will be turned on. A keying signal is generated by the control circuit, whenever the key is depressed, to control the keying circuits in the IF unit. This keying signal is also used as the transmit/receive signal during break-in operations.

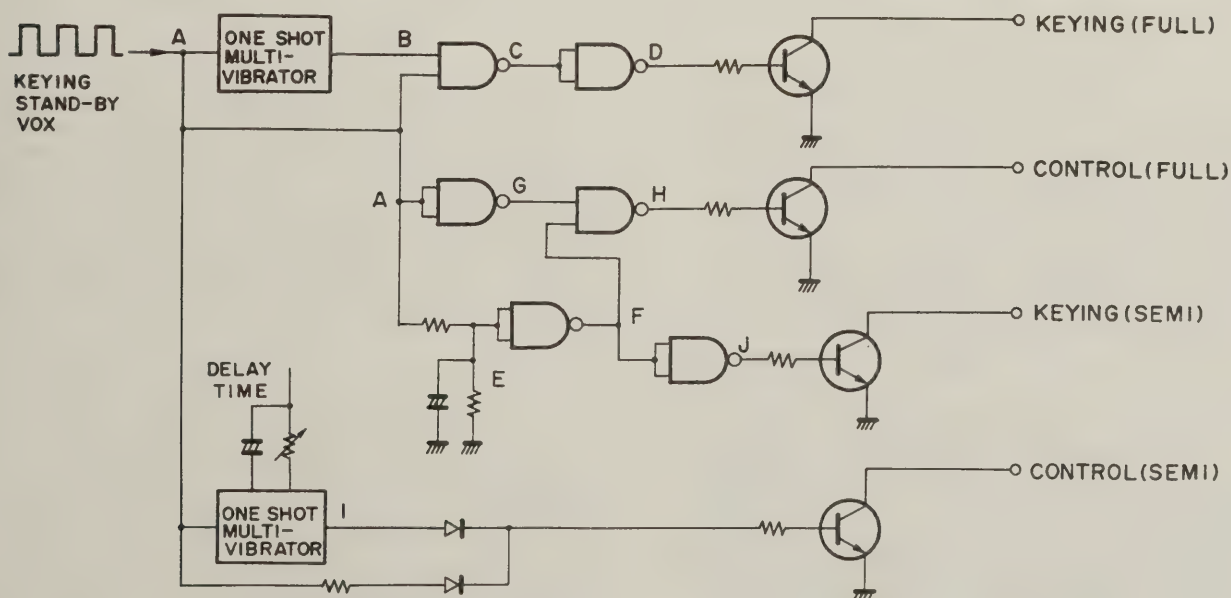


Fig. 9-2 FULL/SEMI BREAK-IN timing chart

## CIRCUIT DESCRIPTION

## CIRCUIT DESCRIPTION

## 4) Speech processor

IC4 in the IF unit functions as the first stage microphone amplifier or audio speech processor. When the processor switch is off, IC4 functions as a 20 dB microphone amplifier. When the processor switch is on, IC4 functions as an up to 40 dB

gain amplifier with ALC. When the processor switch is on, 8 VDC is supplied to the base of the gain adjustment switch-transistor, Q41, driving the feedback amplifier.

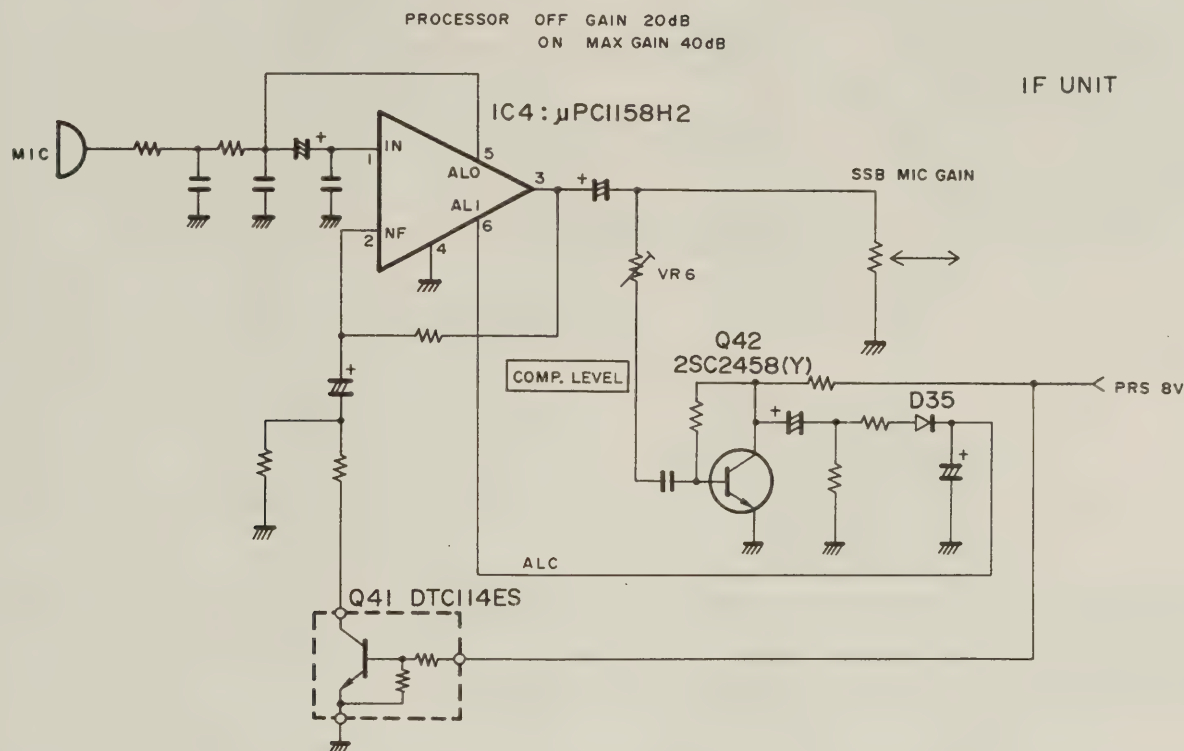


Fig. 11

## 4. PLL Circuits

## Theory of PLL circuit operations

The TS-440 PLL circuit uses a reference frequency of 36 MHz and consists of five PLL loops covering the range of frequencies from 30 kHz to 30 MHz in 10 Hz steps. The PLL circuit has an IF shift function which is implemented by inserting carrier frequencies between PLL loops. The PLL loops include a carrier circuit PLL loop and an HET circuit PLL loop which generates a constant frequency of 36.22 MHz. Frequency division for these PLL loops is controlled by the microprocessor. In all PLL loops phase comparison is made using the reference frequency  $f_{STD}$  (frequency control using a single crystal oscillator).

Figure 12 is the PLL circuit block diagram.

The reference frequency ( $f_{STD}$ ) is generated by a 36 MHz crystal oscillator and Q21 (2SC2787). Reference frequency signals are fed into the main loop's IC11 (SN16913P) via a buffer consisting Q22 and Q23 (2SC2668). The signal is also fed into IC13 (SN74S112) via a buffer consisting of Q24 (2SC2668). In IC13, the signals are frequency divided to generate a 9 MHz signal. The 9 MHz signal is used as the reference frequency signals for the PLL loops.

## • PLL5

PLL5 consists of IC18 (MN6147) and its associated loop components. VC05, Q36 (2SK192A), is locked at a frequency of 36.22 MHz. The 9 MHz reference frequency signal is supplied to pin 3 of IC18, where the signal is divided by 1800 (450 in FM mode) to generate a 5 kHz (20 kHz in FM mode) signal used for comparison. VC05's output signal is supplied to IC18 pin 16 via Q37 (2SC2668), where the signals are frequency divided by 7244 (1811 in FM mode). The phase of the signal is then compared with that of the 5 kHz (20 kHz in FM mode) signal by the phase comparator and the VC05 oscillation frequency is locked. Frequency division data is supplied by digital unit (DAO to DA3 and CK4).

As described above, the dividing ratio used varies depending on which mode the TS-440 is in, FM mode or SSB. This is because the apparent time constant is increased without changing the active LPF constant so that the PLL signals can be modulated easily and reducing distortion during FM transmission. In modes other than FM, the amount of frequency shift due to mechanical vibrations is reduced because the apparent time constant is reduced. The output from PLL5 goes through buffer Q38 (2SC2668) and LPFs, and is used as the HET signal in the RF unit.



## CIRCUIT DESCRIPTION

into pin 2 of MIX5 IC7 (SN16913P) via the LPF. In MIX5, the signal is mixed with the signal generated by PLL4 and goes through the BPF to generate a signal in the range of 6.53 MHz to 6.6301 MHz (in 100 Hz steps). The generated signal is supplied to pin 5.

### • PLL2

PLL2 consists of IC9 (MN6147) and its loop circuitry. VC02, Q18 (2SC2668), is locked in the range of 58.25 MHz to 53.2501 MHz. The 9 MHz reference frequency signal is supplied to pin 3 of IC9, where the signal is divided by 450 to generate a 20 kHz signal for frequency comparison. VC02's output goes through buffer amplifier Q19 (2SC2668), and is fed into MIX4 pin 2 and mixed with the 6.35 MHz to 6.63 MHz signals applied to pin 5. The mixed signal then goes through the BPF to obtain 64.78 MHz to 59.88 MHz signal (in 100 kHz steps). The 64.78 MHz to 59.88 MHz signal is fed into IC9 pin 16 via buffer amplifier Q15 (2SC2668). In IC9, the signal is divided by M, and the phase of signal is compared with that of the 20 kHz reference signal by the phase comparator, and thus MIX4 output is locked (in 100 kHz step). The division ratio M is supplied from the digital unit (DA0 to DA3 and CK1), and is in 50 steps from 3239 to 2994 corresponding to 0.00 MHz to 0.49 MHz.

The output from PLL2 goes through buffer amplifier Q20 (2SC2668) and is divided by ten in IC10 (M54460L). Via the LPF, the signal is fed into pin 2 of MIX3 IC11 (SN16913P). The frequency of the signals depends on the values of L and M, and is in the range of 5.825 MHz to 5.32501 MHz (10 Hz step).

VR1 in MIX4 circuit is used to suppress spurious outputs from the mixer. It is necessary to prevent PLL2 from becoming unlocked.

Signals generated by PLL2 and the 9 MHz reference frequency are mixed in MIX3. The mixed signal goes through the BPF, and is further mixed with  $f_{L0}$  in MIX2 IC12 (SN16913P) on the IF unit. The output from MIX2 goes through the BPF to obtain 38.55 MHz to 39.04999 MHz. The signals are then mixed with the output from the final VCO oscillator in MIX1.

### • PLL1

The last PLL loop, PLL1, consists of IC17 (MB87006) and its loop components. In IC17, frequency division for reference and comparison frequencies is set by serial data (SO, SCK, and LE). When an external prescaler is used, IC17 has a modulus control function for configuring the pulse swallow counter.

The VCO oscillator output from the RF unit goes through Q26 (2SC2668) in the PLL unit and is fed into MIX1. The mixed signals go through the BPF, and they are then amplified by buffer amplifiers Q27 thru Q30 (2SC2668), shaped by IC15 (SN74S10N1/3), and fed into IC16 (WN74S112N) 1/3, or 1/2 prescaler. Basically, IC16 is a two-level FF circuit and functions as a 1/4 divider. But, when IC17 of the PLL unit sends control signals, to IC16, IC16 functions as a 1/3 or 1/2 frequency divider in conjunction with IC15 (2/3). That is, the IC15, IC16, and IC17 form a pulse swallow frequency divider.

The 9 MHz reference frequency signal is supplied to pin 1 of IC17, where the signals are divided by 18 to generate a 500 kHz signal for frequency comparison. Signals fed into IC17 pin 8 via MIX1 and the buffer amplifier are divided by N, and the phase is compared with that of the 500 kHz reference signals by the phase comparator. The signal then goes through the active LPFs Q31 to Q33 (2SC2459) and is fed into the RF unit as VCO voltage signals to control the variable capacitor of the final VCO. The frequency divider N covers the full range of operating frequencies from 30 kHz to 30 MHz (500 kHz step), and it has 61 steps of frequency division data supplied by the microprocessor in the digital unit.

The last VCO signal in PLL1 therefore depends on the values of L, M, and N, and it is in the range from 45.08 MHz to 75.05 MHz (10 Hz step). N is expressed as follows:

$$N = PN_0 - A \\ (N_0 > A)$$

P: Prescaler module value

No: Programmable counter value

A: Swallow counter value

PLL IC contains  $N_0$  and A.

The last VCO unit is contained in the RF unit and consists of four VCOs, each handling one portion of frequencies from 30 kHz to 30 MHz. The appropriate VCO is selected by the microprocessor according to band information from the digital unit.

### • Unlock

If a PLL loop enters a unlock state, the output on the UL pin becomes L. This L signal is sent to the digital unit to stop the microprocessor.

### • 500 kHz marker signal

The 500 kHz reference signal for frequency comparison is supplied from IC17 pin 13, and it is used as the marker reference signal.

## 5. Digital control circuit

The TS-440 digital control circuit uses an 8-bit CPU (7800) which does not contain ROM, and has a 16K ROM (27128) and a 2K RAM (8418) outside the CPU. A common bus used for data exchange between the CPU and RAM, and between the CPU and ROM and is also connected in parallel to the two 8255's for extended I/O and an 8251 for interface to a personal computer (option). To transfer data to or from an appropriate IC, the CPU uses the WR or RD signal, and the chip select signal from the 74LS138.

The display is dynamically controlled by software, and consists of 13 digits and nine segments. The 13 digit and seven segment signal is driven by the high voltage resistive buffer (6300), and the other two segment signals are driven by a transistor. The 7800 transfers data serially. The clock signal is frequency divided by two in the 4013 and sent to the 6300. Using the 4011 and 4030, the encoder generates count

## CIRCUIT DESCRIPTION

pulses and U/D signals from two clock signals which are 90° out of phase with each other, and sends the pulses and signals to the 7800. A clock pulse interrupts the 7800 and a U/D signal causes the 7800 to perform a count up or down operation for each step. If fast rotation occurs, the 7800 processes several steps of PLL data at one time.

Voltages from the RIT and IF shift VRs are converted from analog to digital by the A/D convertor IC (4052) and fed into the 7800. The voltages are used to drive the display and are reflected in the PLL data.

The digital control circuit contains two 8255's for extended I/O. The 8255 in control unit A is an output-only element and the 8255 in control unit B is an input-only element for key scan and static data. The output 8255 emits VS-1 signals,

PLL data for the 6147, clock signals, and 1 MHz LED data. The input 8255 receives key scan data such as panel switch data and DIP switch data for CAR compensation. It also receives static data which cannot be entered as a portion key scan data.

The 7800 outputs four bits of band and mode information (11 bands in the frequency range from 30 kHz to 30 MHz). Each time the 8251, used as the interface to a personal computer, receives one byte of data, the 7800 is interrupted and reads the data from the 8251. The 7800 analyzes any command in the data. In response to the command, the 7800 controls setting or writes data to the 8251 as required. The 8251 serially sends one byte of data including a start bit, synchronizing to a 4800 Hz clock signal.

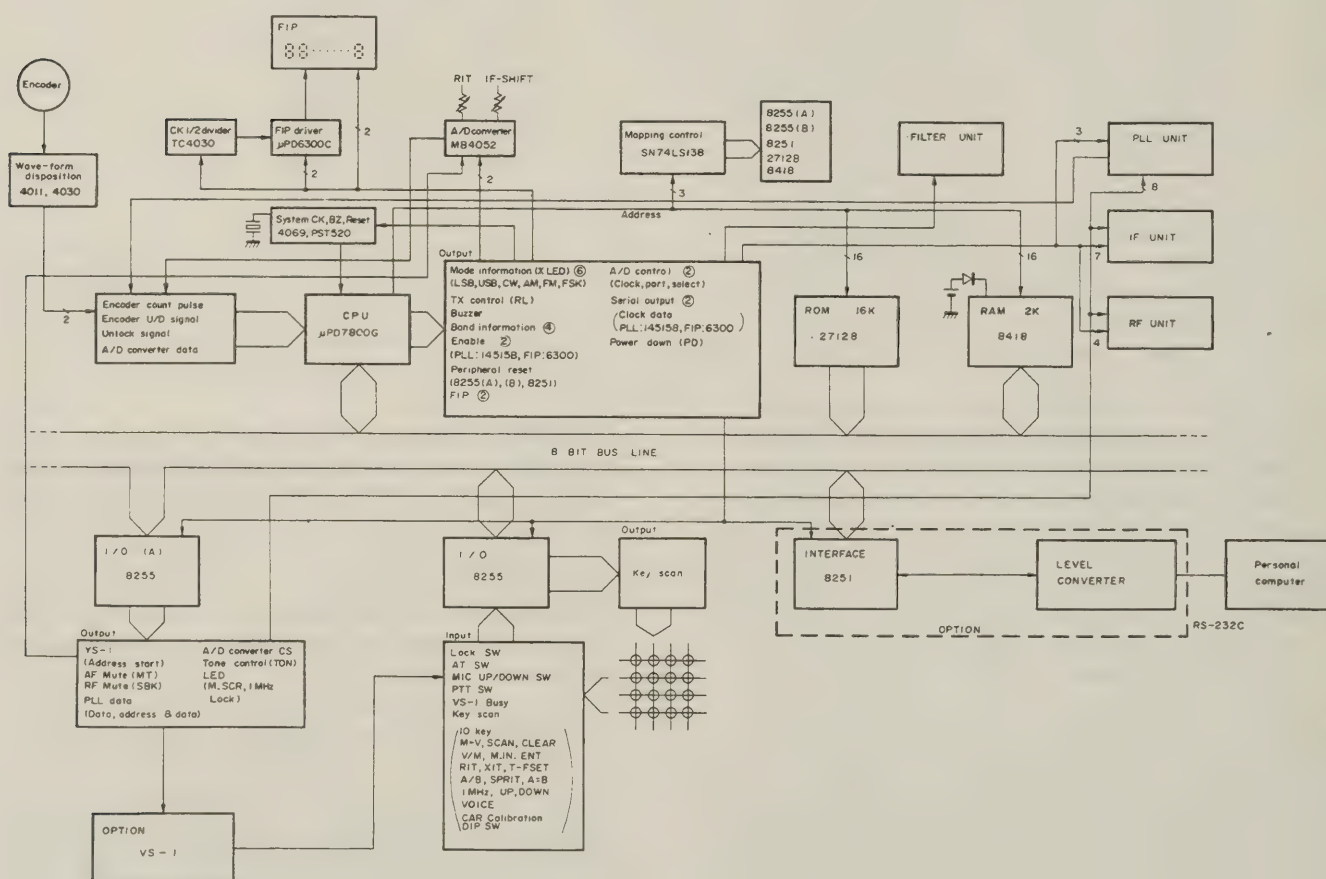


Fig. 13 Control circuit block diagram

## CIRCUIT DESCRIPTION

### 1. Encoder

The TS-440S uses an optical encoder. Two different clock signals from the encoder are  $90^\circ$ , out of phase with each other. This phase difference is not adjustable but depends on the precision of the module. The two clock signals are

converted into clock pulses (250 pulses/rotation  $\times 4$ ) and U/D signals indicating the direction of rotation by the 4011 and 4030 and fed into the 7800. Figure 15 is a timing chart for clock pulse and the U/D signal transmitted to the 7800.

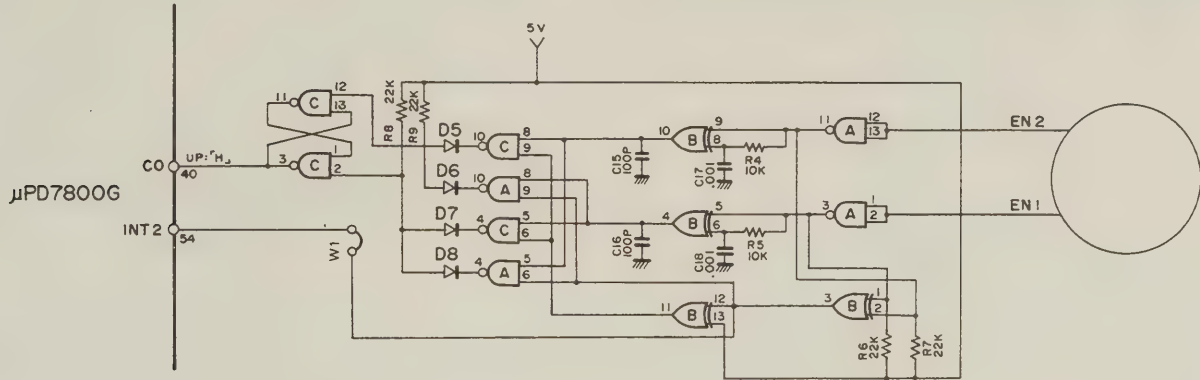


Fig. 14 Encoder circuit

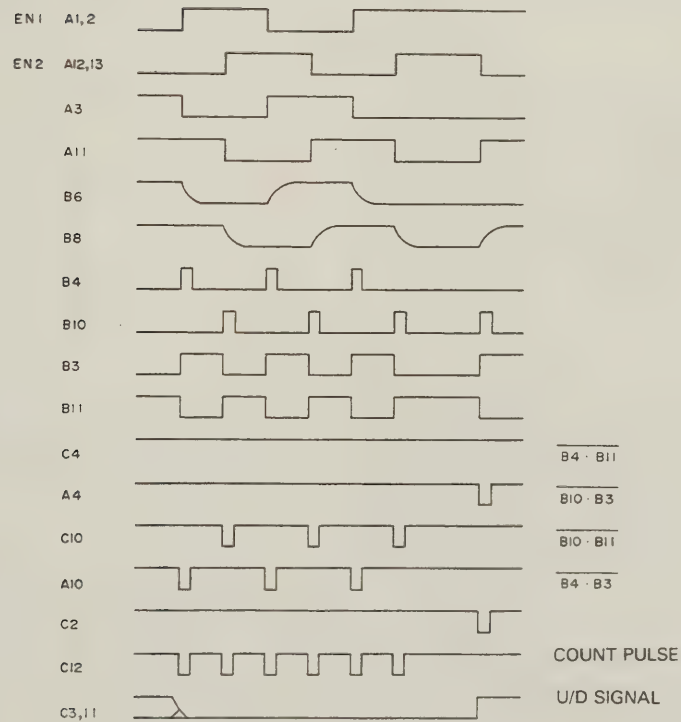


Fig. 15 Encoder waveform timing chart

20

## CIRCUIT DESCRIPTION

## 4. Static input

| 7800 (IC1)  |                    |                    |
|-------------|--------------------|--------------------|
| C0          | Encoder U/D signal | "H" when UP        |
| C2          | Unlock signal      | "L" when unlock    |
| 07          | 4052 (IC: Display) | A/D convertor data |
| 8255 (IC53) |                    |                    |
| B0          | Lock switch        | "L" when switch on |
| B2          | AT switch          | "L" when switch on |
| B3          | MIC UP switch      | "L" when switch on |
| B4          | MIC DOWN switch    | "L" when switch on |
| B5          | PTT switch         | "L" when switch on |
| B7          | VS-1 busy signal   | "H" when VS-1 busy |

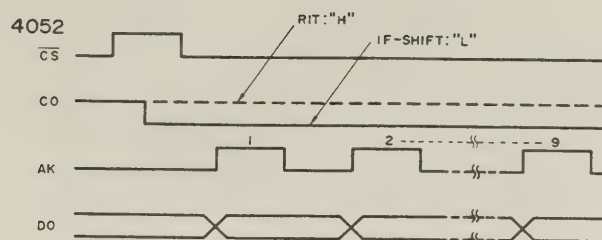
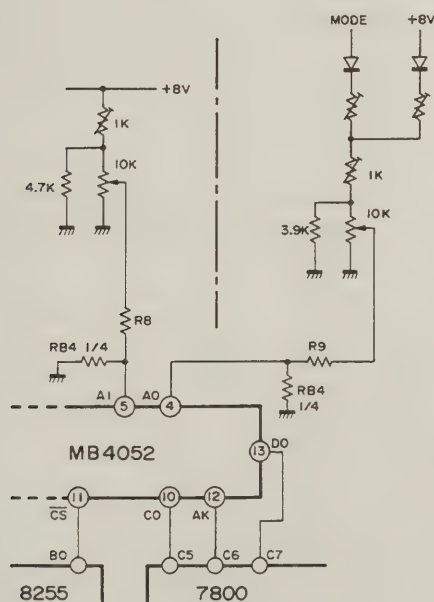
Table 11.

## 5. A/D convertor input

Voltages controlled by the RIT and IF shift VRs are applied to the 4052 (IC2: Display). The 4052 has four analog inputs: A0 (IC2 pin 4) is connected to the IF shift VR, and A1 (pin 5) is connected to the RIT VR, the other two inputs are not used. When reading IF shift data, the 7800 sets port C5 to 0 and selects 4052 A0. As a result, the 3255 sends a positive pulse from port B0 to reset the 4052, and the 7800 sends nine positive pulses from port C6, and port C7 receives data. When reading RIT data, the 7800 sets C0 from the 4052 to H and thereafter performs the same operations as when reading IF shift data.

1) RIT

2) IF SHIFT



A/D convertor input

Fig. 17 A/D convertor circuit

## 6. AT control

When the AT switch is turned on with the AUTO/THRU switch in the AUTO position, 8255 (IC53) ports B2 and B5 go on. When the 7800 knows that the AT switch is on via port B2, it will enter the CW-mode, and sets port A2 to H and A0, A1, and A3 to A6, and B4 to L, and transfer a power down signal. The 7800 then knows that the PTT switch is on via 8255 port B5, and sets port A6 (transmission control signal) to H, enabling transmission. However, if the selected frequency does not allow the 7800 to prepare for transmission, 7800 port A6 remains L and the 7800 will not enable transmission. When the selected frequency is 1.9 MHz or less, the 7800 will not enter CW mode nor send a power down signal.

## 7. LED output

Depending on the mode, the 7800 makes the 8255 (IC2) send M, SCR, 1 MHz, and lock LED signals from ports B4, B5, and B6. When the LED goes on, these ports are L. When the mode LED is on, 7800 ports A0 to A5 are H. A0 to A5 correspond to LSB, USB, CW AM, FM, and FSK respectively. Mode LED output is used as mode control signals in the IF unit.

## 8. VS-1 (option)

When the voice switch is turned on, an address corresponding to the instruction (numerical data) entered is sent from 8255 (IC2) ports A0 to A4 and a positive start pulse signal is sent from port A5. The VS-1 sends busy signals (H) to 8255 (IC53) port B7 while the voice switch is on. After the voice switch goes off, an address corresponding to the next instruction and a start signal are sent.

9.  $\mu$ PD 7800 reset circuit

The 7800 reset circuit is used to initialize the 7800 when the POWER switch is turned on. This circuit supplies a reset pulse to the 7800 after the clock is supplied to the 7800 system clock input, X1 (pin 31). Since IC3 remains on until PST520D (IC3) pin 1 reaches 4.3 V, C10 is not charged, enabling a reset signal to be supplied. When pin 1 exceeds 4.3 V, IC3 goes off, causing C10 to charge via R2 and R3 and the reset signal is removed.

## CIRCUIT DESCRIPTION

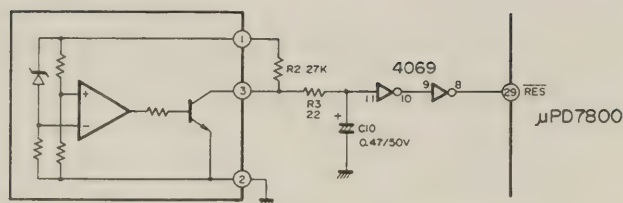


Fig. 18 Reset circuit

## 10. PLL output block

The PLL output block controls five PLL loops. The 500 kHz step PLL loop uses an MB87006 and the other PLL loops use MN6147s.

The M387006 has two dividers: one for the PLL reference frequency and the other for a swallow type counter. Frequency division data for the reference frequency is sent only one when the TS-440 power is switched on.

The MN6147 uses the PLL data format shown figure 19.

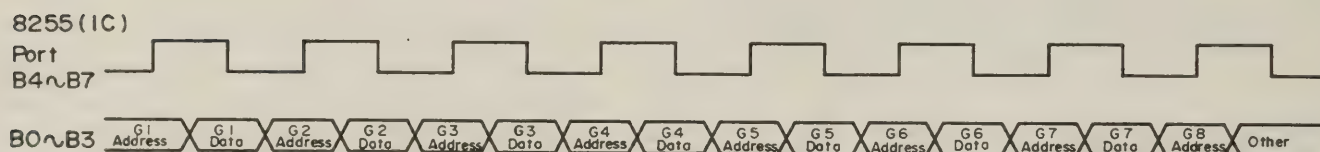


Fig. 19 MN6147 PLL data

Since the MN6147 has latches as shown in Figure 20, only data following a change is output. G0 data can be any data since it is used to transfer G2 and G7 data to the G8 latch.

## 11. Other outputs

**RL output (7800 port A6)**

This output signal controls transmission. When transmitting, this signal is "H".

**BZ (Buzzer) output (7800 port A7)**

This output signal makes the BZ circuit active. When this signal is "H", the oscillator circuit operates.

**RESET output (7800 port B7)**

This output signal resets the two 8255s and 8251 (option).

**SBK output (8255 (IC2) port A6)**

This output signal switches the RF unit to prevent noise due to PLL switching.

**MT output (8255 (IC2) port A7)**

This output signal controls the AF output to prevent noise due to PLL switching.

**SCH output (8255 (IC2) port C0)**

This signal controls the sub audible tone encoder. The sub-tone is activated whenever a transmit frequency in M-CH 90-99 has been selected, in the FM mode. A logic H activates the encoder.

## 12. CAR compensation DIP switch

This switch is used to compensate the absolute frequency characteristic of the 455 kHz filter. The characteristic can be compensated within the range of -400 Hz to +375 Hz. LSB and USB can be compensated separately. When LSB is compensated, FSK is also compensated.

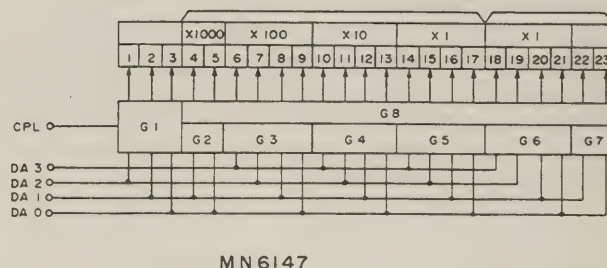


Fig. 20 Data input terminal and programmable counter

| SW No. | Hz  |     |
|--------|-----|-----|
| 1      | 25  | LSB |
| 2      | 50  |     |
| 3      | 100 |     |
| 4      | 200 |     |
| 5      | 400 | USB |
| 6      | 25  |     |
| 7      | 50  |     |
| 8      | 100 |     |
| 9      | 200 |     |
| 10     | 400 |     |

Table 12

When all bits are off, -400 Hz is supplied for compensation. When no compensation is required, bits 5 and 10 must be on.

## CIRCUIT DESCRIPTION

## 13. Band information generation circuit (in the RF unit)

Band information from the control unit is sent to connector 15 of the RF unit. Band information signals B0 to B3 form a BCD code in which B0 corresponds to LSB. Q4D (M74LS145P) is used to convert data from BCD to DEC, and it generates control signals for ten of the 11 bands. Control signals for the remaining band (25.5 MHz to 30 MHz) are generated in the AND circuit consisting of D57, D58, and Q46. These control signals go through the current buffer consisting of Q41 to Q45 (M54561P and 2SA562Y), and are OR'ed by diodes, as required, and sent to AT unit, filter unit, CO, and ANT BPF, as shown in Figure 21.

Band information 7800 PB<sub>0</sub> ~ 3, B<sub>3</sub>B<sub>2</sub>B<sub>1</sub>B<sub>0</sub>

|                   |         |
|-------------------|---------|
| 30kHz ~ 0.5MHz    | 0 0 0 0 |
| 0.5MHz ~ 1.6MHz   | 0 0 0 1 |
| 1.6MHz ~ 2.5MHz   | 0 0 1 0 |
| 2.5MHz ~ 4MHz     | 0 0 1 1 |
| 4MHz ~ 6MHz       | 0 1 0 0 |
| 6MHz ~ 7.5MHz     | 0 1 0 1 |
| 7.5MHz ~ 10.5MHz  | 0 1 1 0 |
| 10.5MHz ~ 14.5MHz | 0 1 1 1 |
| 14.5MHz ~ 22MHz   | 1 0 0 0 |
| 22MHz ~ 25.5MHz   | 1 0 0 1 |
| 25.5MHz ~ 30MHz   | 1 0 1 0 |

Table 13

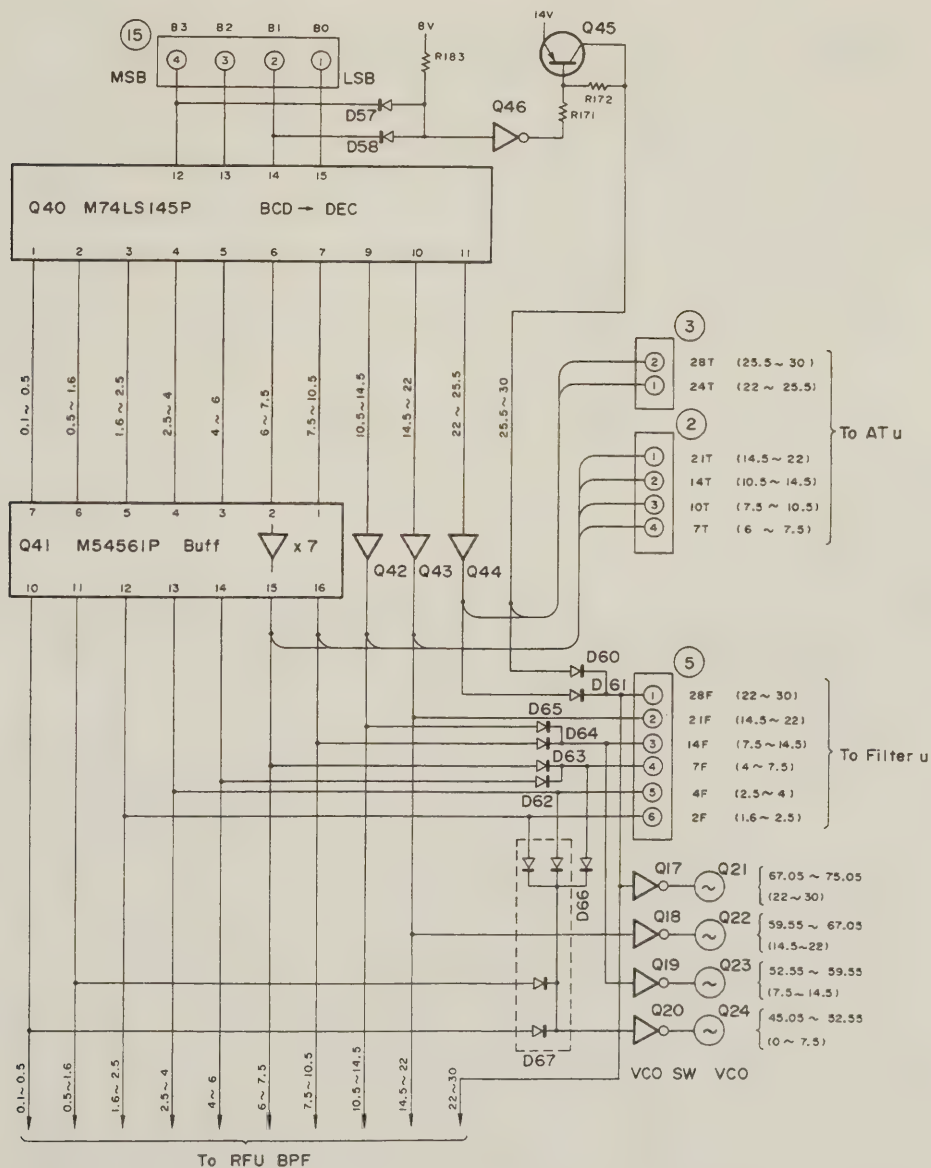


Fig. 21 Band information generation circuit

## CIRCUIT DESCRIPTION

## 14. Mode control signals

Transmit/receive mode signals are generated by IC10 in the IF unit. IC10 is a hybrid IC containing five pairs of PNP transistors and diodes.

Figure 22 shows its equivalent circuit. When the mode signals SSB, CWB, RYB, AMB, and FMB are applied to pins 6

to 10, the voltages of control pins 16 and 17 change. During reception, these signals change to SSR, CWR, RYR, AMR, and FMR. During transmission, these signals change to SST, CWT, RYT, AMT, and FMT.

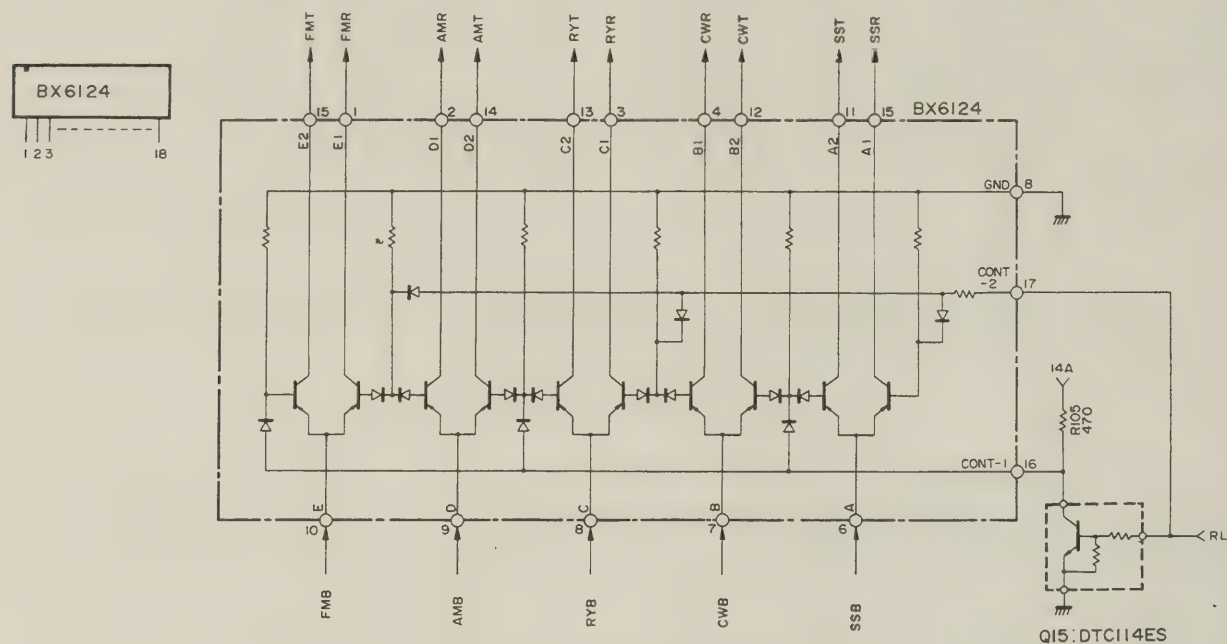


Fig. 22 Mode control circuit

## 15. Expand function

Control unit (X53-1450- 11 )

| D No. | Shipped        |       | Diode cut   |
|-------|----------------|-------|-------------|
| 65    | Mode beep tone | Morse | Single tone |
| 66    | 10Hz display   | OFF   | ON          |
| 67    | Memory protect | OFF   | ON          |
| 73    | CW shift       | 800Hz | 400Hz       |
| 78    | W 24 TX        | No    | Yes         |
| 79    | W 18 TX        | No    | Yes         |

Table 14 Expand function

## CIRCUIT DESCRIPTION

## 16. Semi-self test function

Semi-self test is started by turning the POWER switch on with the [4] (AM) and T-F SET switches pressed.

This test provides a method of testing the TS-440 digital system in a shorter time during production or servicing. The test enables the following:

1. Circuits which are difficult to test during program execution to be tested easily. For example, dynamic data can be output as static data.
2. Items on which information is held only by the CPU and is not available to the user to be tested.

- a. Approximately threshold level input
- b. Incorrect input due to input pin fault

## Operation procedure

1. POWER SW OFF
2. The power switch on while pushing switch [4] (AM) and switch T-F SET
3. The test number has starts from "0" to "56" and END when turn the VFO knob clockwise.  
Operation chart shows as follow.
4. To reset SEMI-SELF TEST function, Power switch OFF.

## TEST NO. LIST

| TEST NO | Condition                   | TEST NO | Condition                                             |
|---------|-----------------------------|---------|-------------------------------------------------------|
| 0       | Start All Fip's light's     | 31      | RES = "H"                                             |
| 1       | All Fip's light's (Segment) | 32      | " = "L"                                               |
| 2       | All Fip's light's           | 33      | CO = "H" (A/D)                                        |
| 3       | All Fip's OFF (digit)       | 34      | " = "L" ( " )                                         |
| 4       | Each digit lights G1        | 35      | AX = "H" ( " )                                        |
| 5       | " G2                        | 36      | " = "L" ( " )                                         |
| 6       | " G3                        | 37      | 8255 Port A all = "H" (IC2)                           |
| 7       | " G4                        | 38      | " " all = "L" ( " )                                   |
| 8       | " G5                        | 39      | 8255 Port B all = "H" ( " )                           |
| 9       | " G6                        | 40      | " " all = "L" ( " )                                   |
| 10      | " G7                        | 41      | 8255 Port C C0~C3 = "H" ( " )                         |
| 11      | " G8                        |         | C4~C7 = "L"                                           |
| 12      | " G9                        | 42      | " " C0~C3 = "L" ( " )                                 |
| 13      | " G10                       |         | C4~C7 = "H"                                           |
| 14      | " G11                       | 43      | 8255 Port C all = "H" (IC53)                          |
| 15      | " G12                       | 44      | " " all = "L" ( " )                                   |
| 16      | " G13                       | 45      | LOCK,PTT,MIC,U/D,AT,VS-1(BUSY)check                   |
| 17      | BZ ON                       | 46      | [SIMPLEX] VS-1(BUSY)check                             |
| 18      | BZ OFF                      | 47      | Key scan inport check                                 |
| 19      | Mode LED all ON             | 48      | [1] (LSB), [6] ,V/M,VOICE (check)                     |
| 20      | " all OFF                   | 49      | [2] (USB), [7] ,M/V,RIT,A/B (check)                   |
| 21      | RL = "H"                    | 50      | [3] (CW), [8] ,SCAN,XIT,SPRIT (check)                 |
| 22      | " = "L"                     | 51      | [4] (AM), [9] ,MIN,T-FSET,A=B,100L 200L 400L ( " )    |
| 23      | BAND all = "H"              |         | ③ , ④ , ⑤                                             |
| 24      | " all = "L"                 | 52      | [5] (FM), [0] ,(FSK),CLEAR,1MHz,25L 50L 25U 50U ( " ) |
| 25      | PD = "H"                    |         | ① , ② , ⑥ , ⑦                                         |
| 26      | " = "L"                     | 53      | ENT,DOWN,UP, 100U 200U 400U                           |
| 27      | ENF = "H"                   |         | ⑧ , ⑨ , ⑩                                             |
| 28      | " = "L" (immediatly)        | 54      | -                                                     |
| 29      | ENP = "H"                   | 55      | -                                                     |
| 30      | " = "L"                     | 56      | END                                                   |

## CIRCUIT DESCRIPTION

## SW Monitor

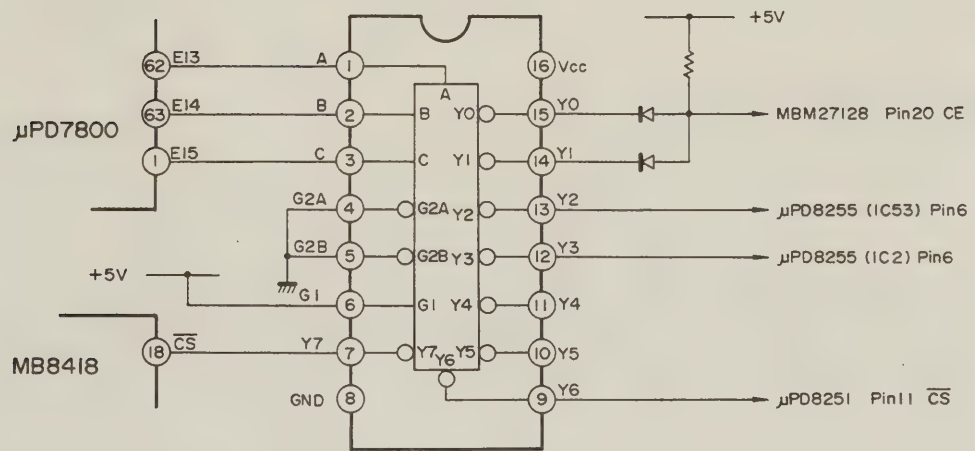
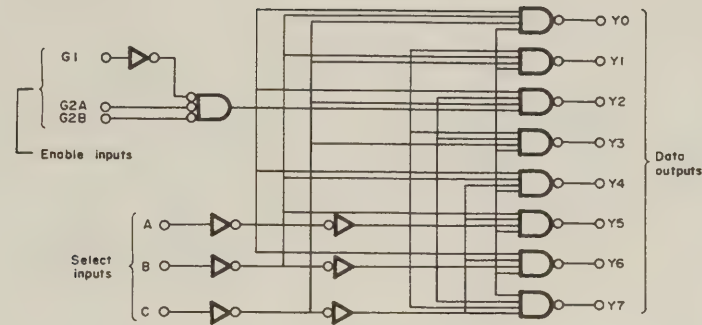
Display changes by TEST number

| TEST NO \ Display | /                     | /              | /     | /      |  | /                     | /                      | /                      | 0                       |
|-------------------|-----------------------|----------------|-------|--------|--|-----------------------|------------------------|------------------------|-------------------------|
| 45                | LOCK                  |                | AT    | MIC UP |  | MIC DOWN              | PTT or AT              |                        | VS-1 BUSY               |
| 46                |                       |                |       |        |  |                       |                        |                        |                         |
| 47                |                       |                |       |        |  |                       |                        |                        |                         |
| 48                | <span>1</span><br>LSB | <span>6</span> | V/M   |        |  |                       | VOICE                  |                        |                         |
| 49                | <span>2</span><br>USB | <span>7</span> | M►V   | RIT    |  | A/B                   |                        |                        |                         |
| 50                | <span>3</span><br>CW  | <span>8</span> | SCAN  | XIT    |  | SPRIT                 |                        |                        |                         |
| 51                | <span>4</span><br>AM  | <span>9</span> | M.IN  | T-FSET |  | A = B                 | 100L<br><span>3</span> | 200L<br><span>4</span> | 400L<br><span>5</span>  |
| 52                | <span>5</span><br>FM  | <span>0</span> | CLEAR | 1MHz   |  | 25L<br><span>1</span> | 50L<br><span>2</span>  | 25U<br><span>6</span>  | 50U<br><span>7</span>   |
| 53                |                       |                | ENT   | DOWN   |  | UP                    | 100U<br><span>8</span> | 200U<br><span>9</span> | 400U<br><span>10</span> |

If the display changes from " / " to " 0 " by operate the key in chart then function working properly.

## SEMICONDUCTOR

## SN74LS138H (Control unit IC51)



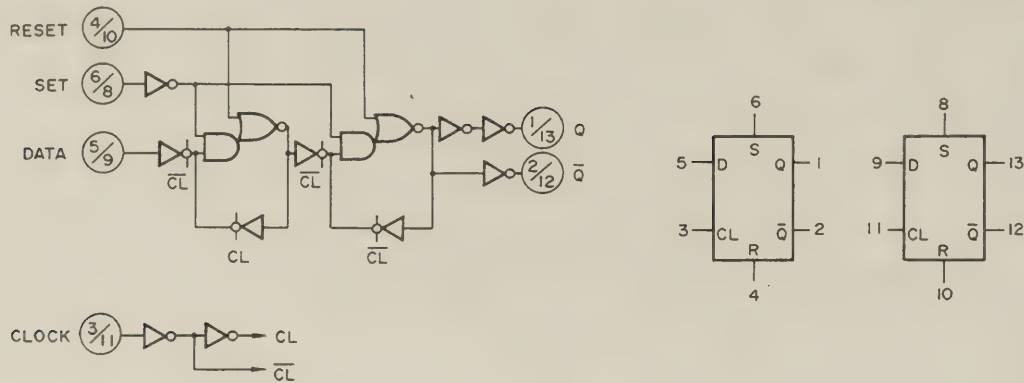
## TRUTH TABLE

| Input          |                |        |   |   | Output         |                |                |                |                |                |                |                |
|----------------|----------------|--------|---|---|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Enable         |                | Select |   |   |                |                |                |                |                |                |                |                |
| G <sub>1</sub> | G <sub>2</sub> | C      | B | A | Y <sub>0</sub> | Y <sub>1</sub> | Y <sub>2</sub> | Y <sub>3</sub> | Y <sub>4</sub> | Y <sub>5</sub> | Y <sub>6</sub> | Y <sub>7</sub> |
| X              | H              | X      | X | X | H              | H              | H              | H              | H              | H              | H              | H              |
| L              | X              | X      | X | X | H              | H              | H              | H              | H              | H              | H              | H              |
| H              | L              | L      | L | L | L              | H              | H              | H              | H              | H              | H              | H              |
| H              | L              | L      | L | H | H              | L              | H              | H              | H              | H              | H              | H              |
| H              | L              | L      | H | L | H              | H              | L              | H              | H              | H              | H              | H              |
| H              | L              | L      | H | H | H              | H              | H              | L              | H              | H              | H              | H              |
| H              | L              | H      | L | L | H              | H              | H              | H              | L              | H              | H              | H              |
| H              | L              | H      | L | H | H              | H              | H              | H              | H              | L              | H              | H              |
| H              | L              | H      | H | L | H              | H              | H              | H              | H              | H              | L              | H              |
| H              | L              | H      | H | H | H              | H              | H              | H              | H              | H              | H              | L              |

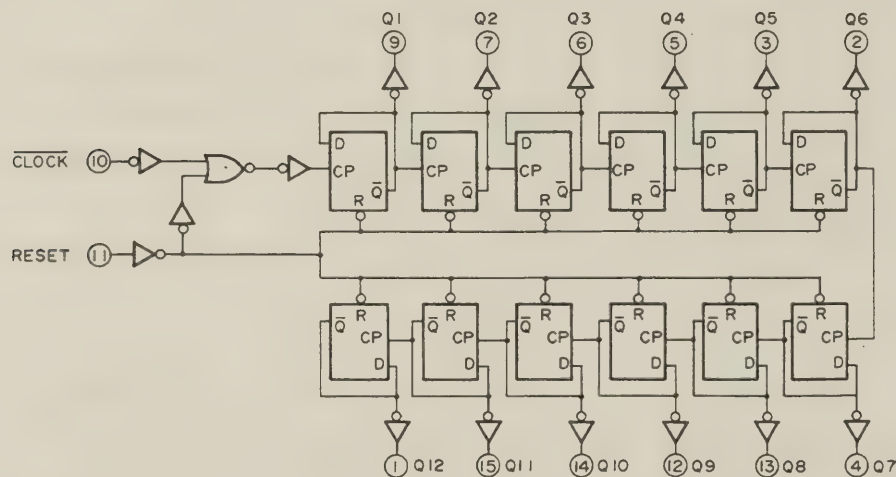
- Note: 1.  $G_2 = G_{2A} + G_{2B}$   
 2. H: High level  
 L: Low level  
 X: "H" or "L"

# SEMICONDUCTOR

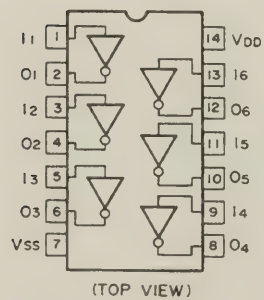
## TC4013 (Display unit IC3)



## TC4040BP (Control unit IC55)

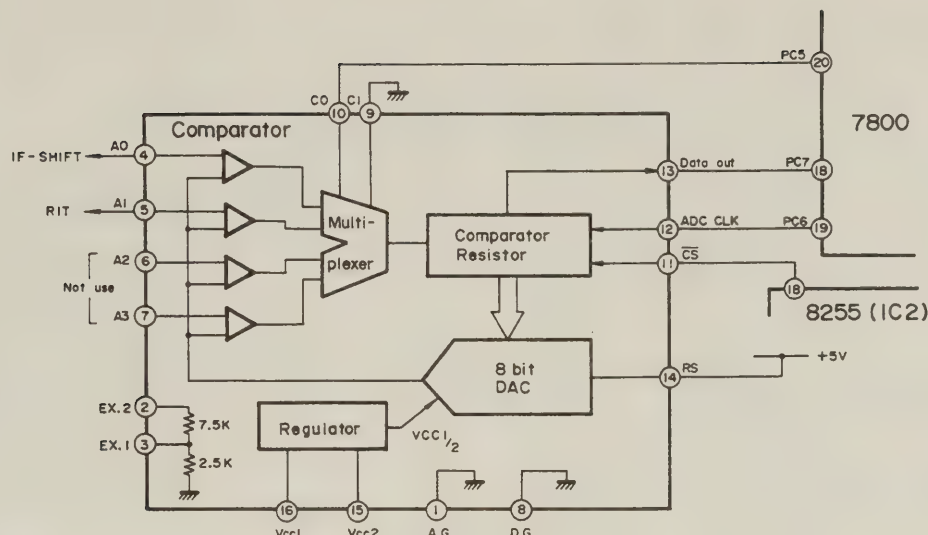


## TC4069BP (Control unit IC4)



## SEMICONDUCTOR

MB4052



### MB4052 Pin Description

### I/O Signal Pin Functions

| Pin No.  | Pin Name                                 | Symbol                               | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------|------------------------------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2        | Range expander input                     | Ex. 2                                | Analog input pin for expanding the range.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 3        | Range expander output                    | Ex. 1                                | Analog output pin for expanding the range. Connect to any pin from A0 to A3. By using Ex. 1, Ex. 2, the range is expanded to the $\times 4$ range.                                                                                                                                                                                                                                                                                                                                   |
| 4~7      | Analog entrance                          | A <sub>0</sub> ~A <sub>3</sub>       | 4-ch analog input pin. Channel 1 is selected by channel select input C0 to C1.                                                                                                                                                                                                                                                                                                                                                                                                       |
| 9<br>10  | Channel select input                     | C <sub>0</sub><br>C <sub>1</sub>     | The input pin to designate the analog input channel for A/D converter. This signal is latched at the trailing edge of $\overline{CS}$ .                                                                                                                                                                                                                                                                                                                                              |
| 11       | Chip select input                        | $\overline{CS}$                      | This is the chip select input pin. When $\overline{CS}$ is inverted from "1" to "0", A/D converting starts and data output is enabled. After A/D converting is over or when an interrupt is required, set the $\overline{CS}$ back to "1".                                                                                                                                                                                                                                           |
| 12       | A/D conversion clock                     | ADC CLK                              | This is the clock input pin for A/D conversion input to the comparator register sequentially. Conversion speed is determined by the clock speed. In the case of 8-bit, approx. 10 clocks will be needed. However, it is not necessary that the clock period be fixed.                                                                                                                                                                                                                |
| 13       | Data output                              | DATA OUT                             | This is the open collector to output the result of A/D conversion. The data is output in the order of the start bit, most significant bit, 2nd significant bit, ..., least significant bit, and the stop bit, synchronized with ADCCLK.                                                                                                                                                                                                                                              |
| 14       | Range select input                       | RS                                   | This is the input pin for selecting the voltage range of analog input. The VFS = V <sub>CC1</sub> /8 range is selected at "0", and the range of FVS = V <sub>CC1</sub> /2 is selected at "1". During conversion, hold this pin to "0" or "1".                                                                                                                                                                                                                                        |
| 1<br>8   | Analog ground<br>Digital ground          | A.G<br>D.G                           | Ground terminal                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 15<br>16 | Power supply pin 2<br>Power supply pin 1 | V <sub>CC2</sub><br>V <sub>CC1</sub> | When driving with 3.5 to 6.0 V of power, connect V <sub>CC1</sub> and V <sub>CC2</sub> to each other, and apply the power voltage to them.<br>When driving 8 to 18 V of power, apply the power voltage to V <sub>CC2</sub> . At this time, the 5 V stabilized voltage is output to V <sub>CC1</sub> , and approx. 10 mA current can be supplied externally to the IC,<br>When either 3.5~6.0 V or 8~18V power is used, V <sub>CC1</sub> is the reference voltage for A/D conversion. |

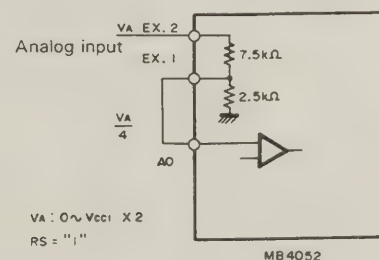
- Channel Select

| $C_1$ | $C_0$ | Selected Ch. |
|-------|-------|--------------|
| 0     | 0     | $A_0$        |
| 0     | 1     | $A_1$        |
| 1     | 0     | $A_2$        |
| 1     | 1     | $A_3$        |

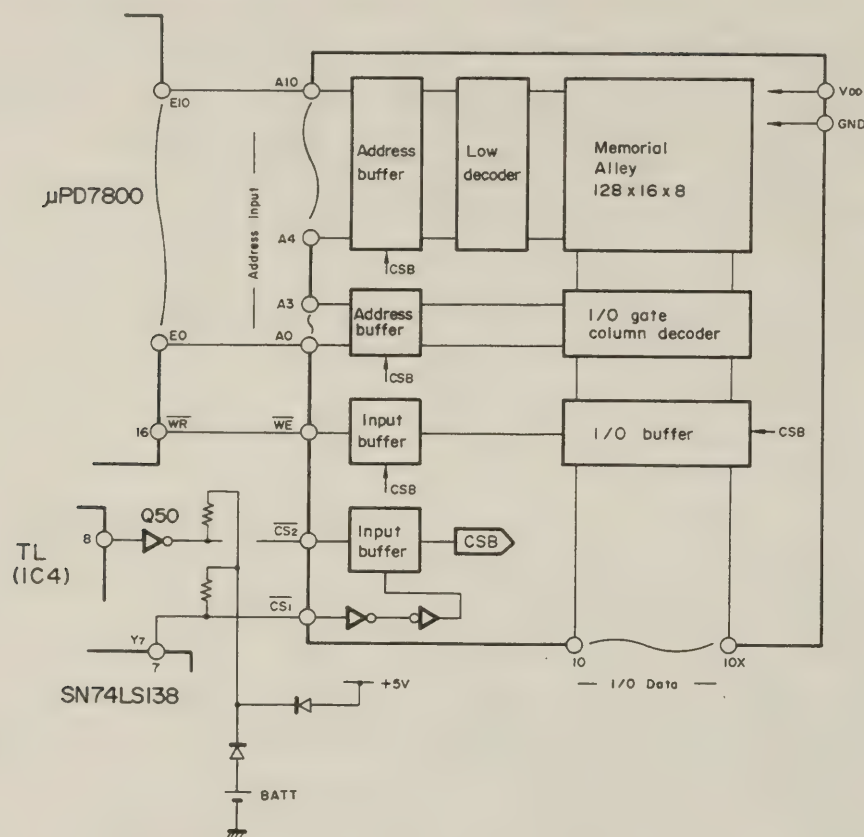
- Range select

| RS | Conversion voltage range   |
|----|----------------------------|
| 0  | $0 \sim \frac{V_{CC1}}{8}$ |
| 1  | $0 \sim \frac{V_{CC1}}{2}$ |

- Wiring example when expanding the range

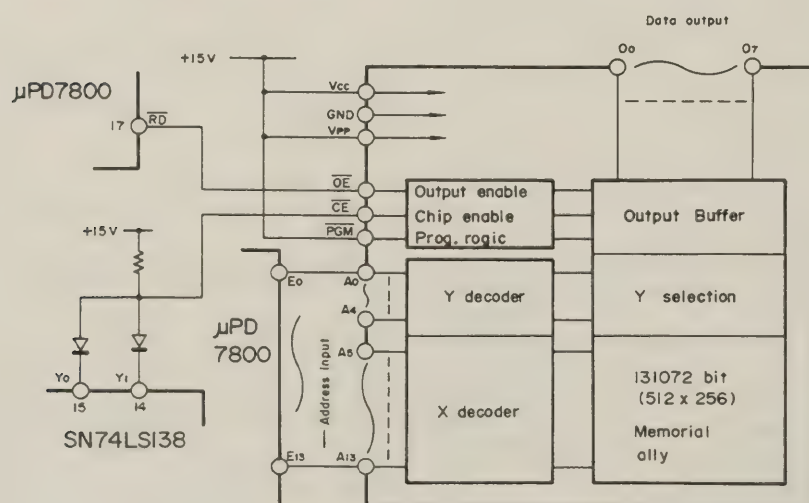


**MB8418-LP20-GRA (Control unit IC50)**



| Symbol               | Pin name      |
|----------------------|---------------|
| $A_0 \sim A_{10}$    | Address input |
| $I( )_1 \sim I( )_x$ | Data in/out   |
| $\overline{CS}$      | Chip select 1 |
| $CS_2$               | Chip select 2 |
| $\overline{WE}$      | Write enable  |
| $V_{cc}$             | Power (1.5 V) |
| GND                  | GND           |
| NC.                  | No connection |

## MBM27128 (Control unit IC52)

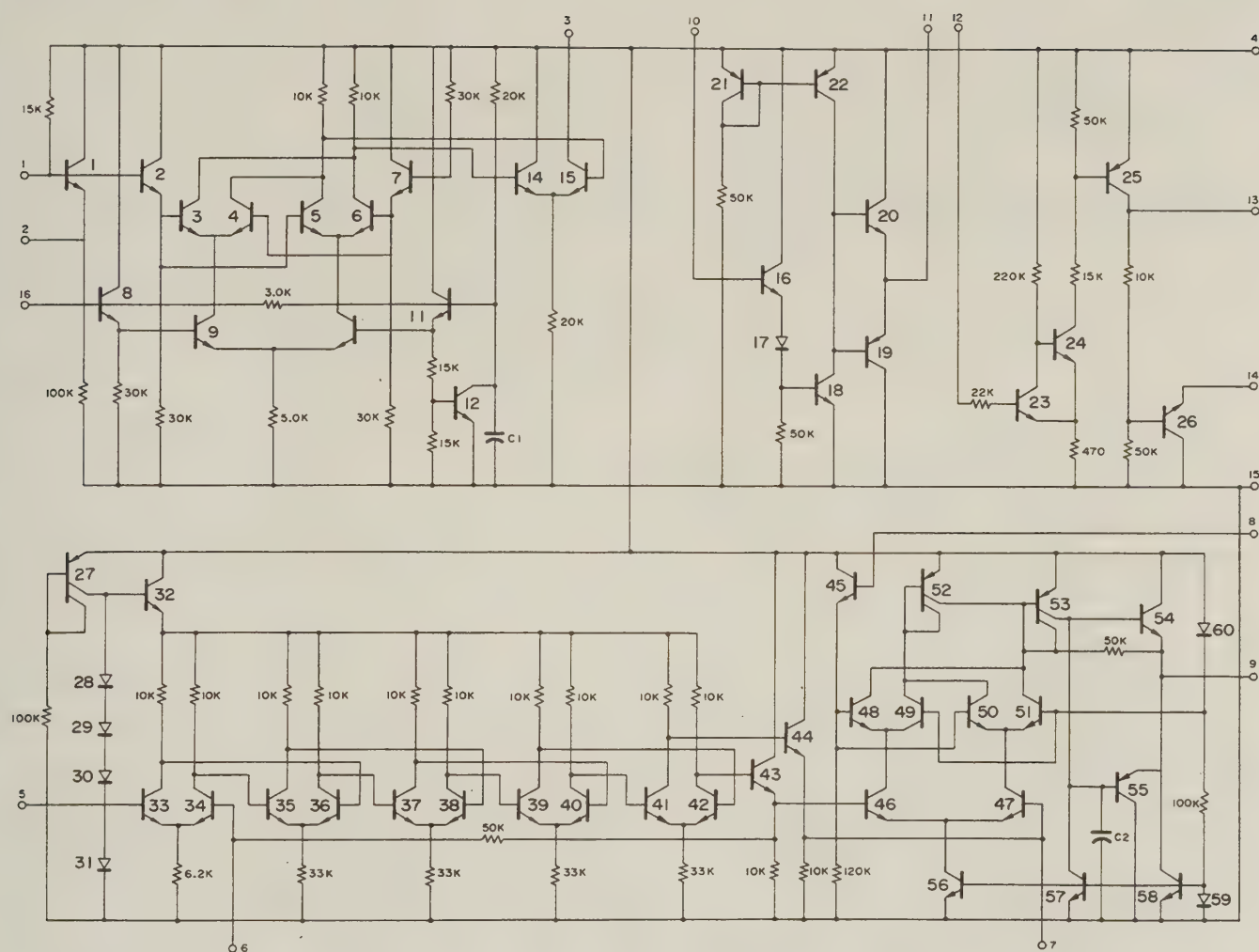


### Pin name

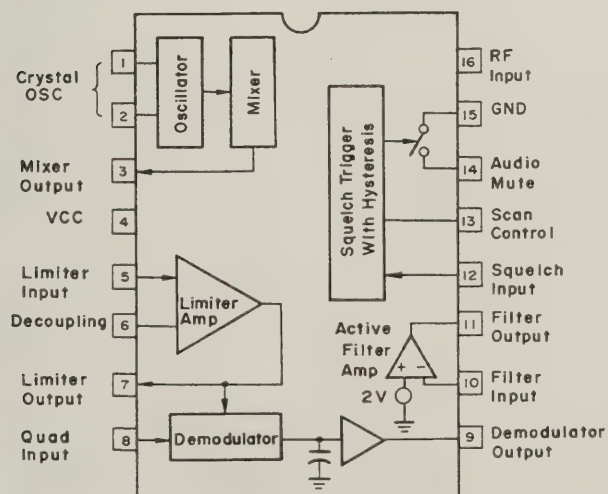
|                   |                      |
|-------------------|----------------------|
| $A_0 \sim A_{13}$ | Address input        |
| $O_0 \sim O_7$    | Data output          |
| $\overline{CE}$   | Chip enable input    |
| $\overline{OE}$   | Output enable input  |
| $\overline{PGM}$  | Program input        |
| Vcc               | Power supply         |
| Vpp               | Program power supply |
| GND               | GND                  |

## SEMICONDUCTOR

MC3347 (IF unit IC2)

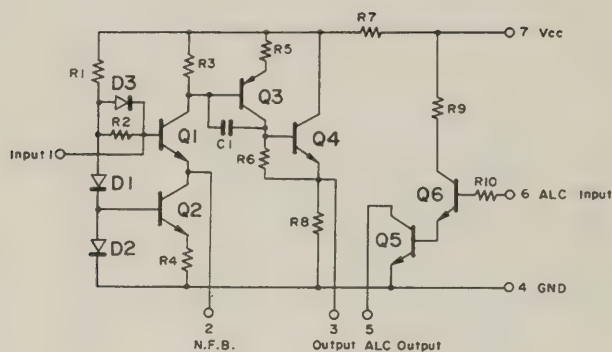
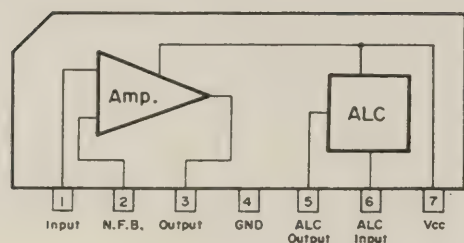


MC3357 (IF unit IC2)



## SEMICONDUCTOR

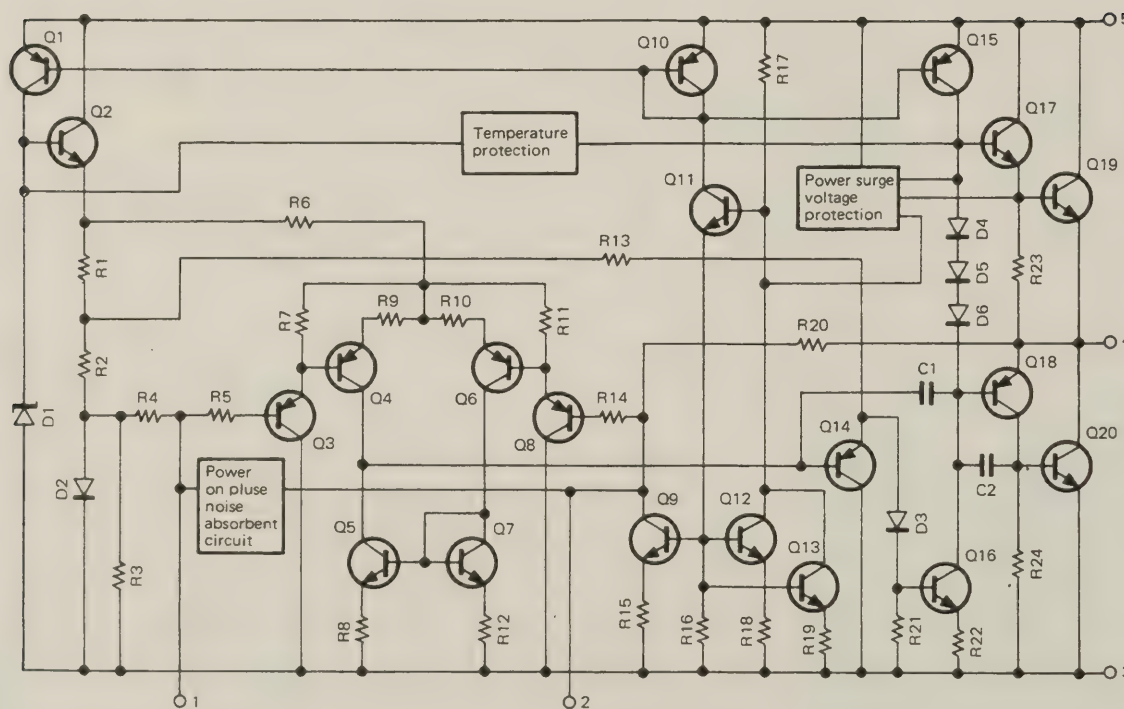
### $\mu$ PC1158H2



#### Pin connection

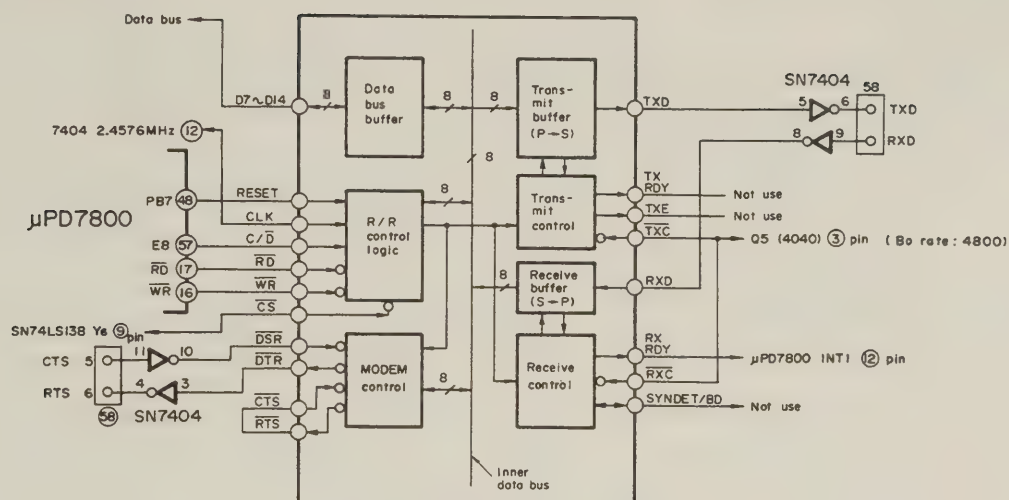
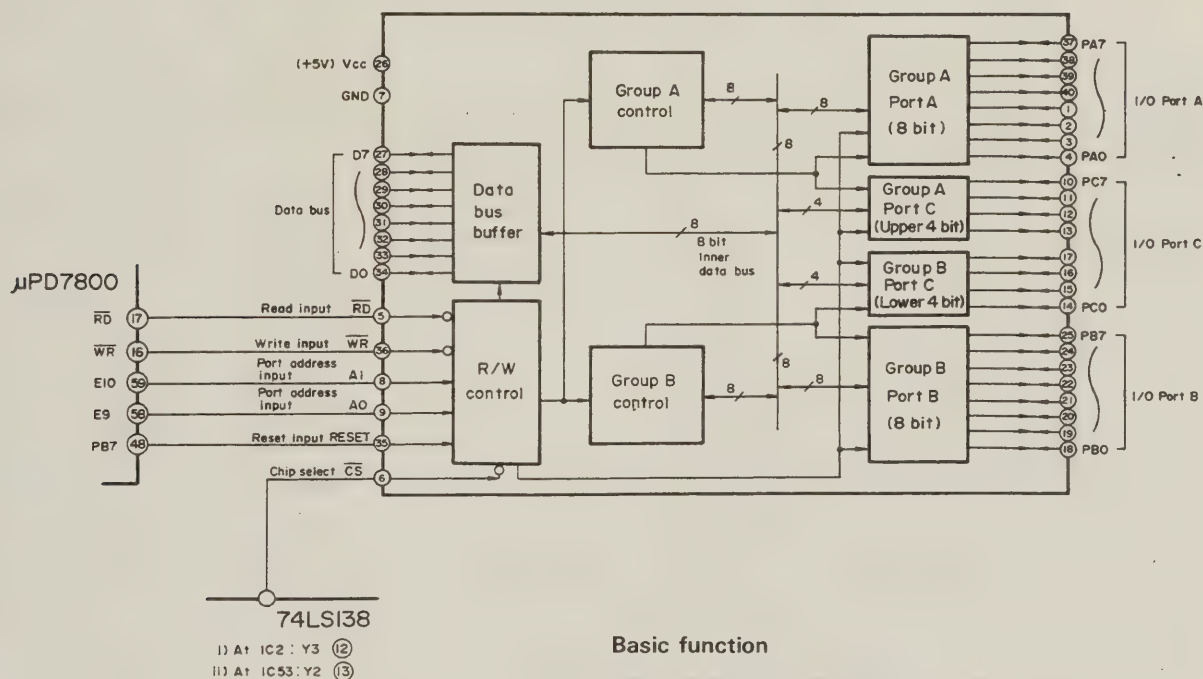
| Pin | Function | Pin | Function   |
|-----|----------|-----|------------|
| 1   | Input    | 5   | ALC output |
| 2   | N. F. B. | 6   | ALC Input  |
| 3   | Output   | 7   | Vcc        |
| 4   | GND      |     |            |

### $\mu$ PC2002V (IF unit IC7)



- 1 : Input
- 2 : NFB
- 3 : GND
- 4 : Output
- 5 : Power supply + Vcc

## SEMICONDUCTOR

 $\mu$ PD8251AC (Control unit IC54) $\mu$ PD8255AC-5 (Control unit IC2, 53)

## Basic function

| A <sub>1</sub> | A <sub>0</sub> | $\overline{CS}$ | $\overline{RD}$ | $\overline{WR}$ | Function                               |
|----------------|----------------|-----------------|-----------------|-----------------|----------------------------------------|
| 0              | 0              | 0               | 0               | 1               | Data bus $\leftarrow$ Port A           |
| 0              | 1              | 0               | 0               | 1               | Data bus $\leftarrow$ Port B           |
| 1              | 0              | 0               | 0               | 1               | Data bus $\leftarrow$ Port C           |
| 0              | 0              | 0               | 1               | 0               | Port A $\leftarrow$ Data bus           |
| 0              | 1              | 0               | 1               | 0               | Port B $\leftarrow$ Data bus           |
| 1              | 0              | 0               | 1               | 0               | Port C $\leftarrow$ Data bus           |
| 1              | 1              | 0               | 1               | 0               | Control register $\leftarrow$ Data bus |
| x              | x              | 1               | x               | x               | Data bus is in high impedance status   |
| 1              | 1              | 0               | 0               | 1               | Combination is inhibited               |

"0" shows low level (L)

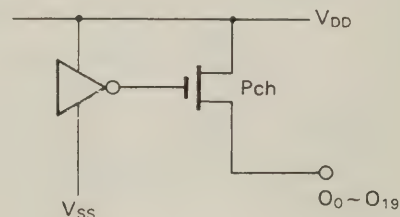
"1" shows high level (H)

## SEMICONDUCTOR

 $\mu$ PD6300C (Display unit IC1)

## Pin description

| Pin No. | Symbol                                                                                                                            | Pin name                                                        | I/O | Description                                                                                                                                                                                                    |
|---------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | O <sub>13</sub><br>O <sub>14</sub><br>O <sub>15</sub><br>O <sub>16</sub><br>O <sub>17</sub><br>O <sub>18</sub><br>O <sub>19</sub> | FIP<br>Segment<br>driver<br>(O <sub>13</sub> ~O <sub>19</sub> ) | O   | High dielectric-strength (40V) output in the Pch open.<br>Corresponds to the output of Q <sub>13</sub> ~Q <sub>19</sub>                                                                                        |
| 7       |                                                                                                                                   |                                                                 |     |                                                                                                                                                                                                                |
| 8       | SO                                                                                                                                | Serial data output pin                                          | O   | Output serial data the trailing edge of SCK. When the n-number of $\mu$ PD6300Cs are connected in series, this can be connected to the SI of the following stage.                                              |
| 9       | $\overline{\text{BI}}$                                                                                                            | Blanking pin                                                    | I   | This input can turn off all indicator or displays, and can dim them by applying a random duty pulse from outside. Active low.                                                                                  |
| 10      | $\overline{\text{LH}}$                                                                                                            | Latch pin                                                       | I   | Transmits the connects of the serial shift register to the buffer register at low level, to latch the connects at the rising time. Active rising (leading) edge.                                               |
| 11      | SI                                                                                                                                | Serial data input pin                                           | I   | This is the data input pin. Inputs data to the shift register at the rising edge of SCK.                                                                                                                       |
| 12      | $\overline{\text{SCK}}$                                                                                                           | Serial clock input pin                                          | I   | Reads out the SI data to the shift register at the rising edge of SCK.<br>Outputs data from SO at the trailing edge of $\overline{\text{SCK}}$ .                                                               |
| 13      | $\overline{\text{CS}}$                                                                                                            | Chip select pin                                                 | I   | When $\overline{\text{CS}}$ is high, this inhibits $\overline{\text{SCK}}$ and $\overline{\text{LH}}$ , and when $\overline{\text{CS}}$ is low, activates $\overline{\text{SCK}}$ and $\overline{\text{LH}}$ . |
| 14      | V <sub>SS</sub>                                                                                                                   | GND                                                             | —   | Connect to the GND terminal of the system.                                                                                                                                                                     |
| 15      | O <sub>0</sub>                                                                                                                    | FIP<br>Segment<br>driver<br>(O <sub>0</sub> ~O <sub>12</sub> )  |     | Pch open-drain system, high dielectric-strength output.<br><br>Corresponds to the output of O <sub>0</sub> to O <sub>12</sub>                                                                                  |
| 16      | O <sub>1</sub>                                                                                                                    |                                                                 |     |                                                                                                                                                                                                                |
| 17      | O <sub>2</sub>                                                                                                                    |                                                                 |     |                                                                                                                                                                                                                |
| 18      | O <sub>3</sub>                                                                                                                    |                                                                 |     |                                                                                                                                                                                                                |
|         | O <sub>4</sub>                                                                                                                    |                                                                 |     |                                                                                                                                                                                                                |
|         | O <sub>5</sub>                                                                                                                    |                                                                 |     |                                                                                                                                                                                                                |
|         | O <sub>6</sub>                                                                                                                    |                                                                 |     |                                                                                                                                                                                                                |
|         | O <sub>7</sub>                                                                                                                    |                                                                 |     |                                                                                                                                                                                                                |
|         | O <sub>8</sub>                                                                                                                    |                                                                 |     |                                                                                                                                                                                                                |
|         | O <sub>9</sub>                                                                                                                    |                                                                 |     |                                                                                                                                                                                                                |
|         | O <sub>10</sub>                                                                                                                   |                                                                 |     |                                                                                                                                                                                                                |
| 26      | O <sub>11</sub>                                                                                                                   |                                                                 |     |                                                                                                                                                                                                                |
| 27      | O <sub>12</sub>                                                                                                                   |                                                                 |     |                                                                                                                                                                                                                |
| 28      | V <sub>DD</sub>                                                                                                                   | Power supply pin                                                | —   | 5 V $\pm$ 10%                                                                                                                                                                                                  |



## PARTS LIST

## CAPACITORS

CC 45 TH 1H 220 J  
1 2 3 4 5 6

- 1 = Type ..... ceramic, electrolytic, etc. 4 = Voltage rating  
2 = Shape ..... round, square, etc. 5 = Value  
3 = Temp. coefficient 6 = Tolerance

## • Temperature Coefficient

| 1st Word | C     | L   | P      | R      | S     | T    | U      |
|----------|-------|-----|--------|--------|-------|------|--------|
| Color*   | Black | Red | Orange | Yellow | Green | Blue | Violet |
| ppm/°C   | 0     | -80 | -150   | -220   | -330  | -470 | -750   |

## • Tolerance

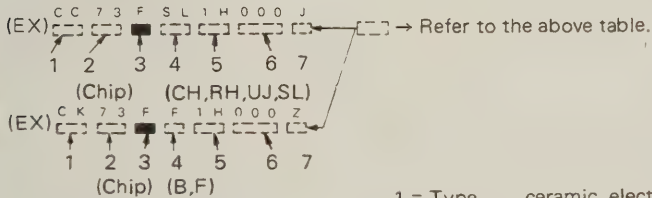
| Code | C      | D     | G   | J   | K    | M    | X            | Z            | P            | No code                     |
|------|--------|-------|-----|-----|------|------|--------------|--------------|--------------|-----------------------------|
| (%)  | ± 0.25 | ± 0.5 | ± 2 | ± 5 | ± 10 | ± 20 | + 40<br>- 20 | + 80<br>- 20 | + 100<br>- 0 | 10μF-10~+50<br>4.7μF-10~+75 |

Less than 10 pF

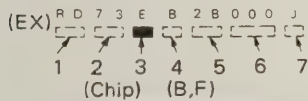
## • Rating voltage

| 2nd word<br>1st word | A    | B    | C    | D    | E    | F    | G    | H    | J    | K    | V  |
|----------------------|------|------|------|------|------|------|------|------|------|------|----|
| 0                    | 1.0  | 1.25 | 1.6  | 2.0  | 2.5  | 3.15 | 4.0  | 5.0  | 6.3  | 8.0  | —  |
| 1                    | 10   | 12.5 | 16   | 20   | 25   | 31.5 | 40   | 50   | 63   | 80   | 35 |
| 2                    | 100  | 125  | 160  | 200  | 250  | 315  | 400  | 500  | 630  | 800  | —  |
| 3                    | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | 8000 | —  |

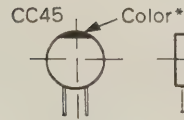
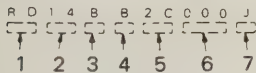
## • Chip capacitors



## • Chip resistor (Carbon)



## • Carbon resistor (Normal type)



## • Capacitor value

- 0 1 0 = 1pF  
1 0 0 = 10pF  
1 0 1 = 100pF  
1 0 2 = 1000pF = 0.001μF

1 0 3 = 0.01μF

2 2 0 = 22pF  
1st number | Multiplier  
2nd number

| 2nd Word | G    | H    | J     | K     | L     |
|----------|------|------|-------|-------|-------|
| ppm/°C   | ± 30 | ± 60 | ± 120 | ± 250 | ± 500 |

Example CC45TH = -470 ± 60 ppm/°C

| Code | B     | C      | D     | F   | G   |
|------|-------|--------|-------|-----|-----|
| (pF) | ± 0.1 | ± 0.25 | ± 0.5 | ± 1 | ± 2 |

## Dimension

| Dimension code | L         | W          | T              |
|----------------|-----------|------------|----------------|
| Empty          | 5.6 ± 0.5 | 5.0 ± 0.5  | Less than 2.0  |
| E              | 3.2 ± 0.2 | 1.6 ± 0.2  | Less than 1.25 |
| F              | 2.0 ± 0.3 | 1.25 ± 0.2 | Less than 1.25 |

## Dimension

| Dimension code | L         | W          | T    | Wattage |
|----------------|-----------|------------|------|---------|
| E              | 3.2 ± 0.2 | 1.6 ± 0.2  | 0.57 | 2B      |
| F              | 2.0 ± 0.3 | 1.25 ± 0.2 | 0.45 | 2A      |

## Rating wattage

| Cord | Wattage | Cord | Wattage | Cord | Wattage |
|------|---------|------|---------|------|---------|
| 2A   | 1 10W   | 2E   | 1 4W    | 3A   | 1W      |
| 2B   | 1 8W    | 2H   | 1 2W    | 3D   | 2W      |
| 2C   | 1 6W    |      |         |      |         |



## PARTS LIST

N: New Parts

\*: Please note that parts are sometimes not in stock, and it takes much time to deliver.

## SEMICONDUCTOR

| Item           | Re-<br>marks | Name      |
|----------------|--------------|-----------|
| Diode          | N            | 1S1555    |
|                |              | 1S133     |
|                |              | 1S2588    |
|                |              | 1S1587    |
|                |              | 1S1007    |
|                |              | 1SV53A    |
|                |              | 1SV153    |
|                |              | 1SS101    |
|                |              | 1SS99     |
|                |              | 1N60      |
|                |              | 1N4448    |
|                | N            | S31C      |
|                |              | BA282     |
|                |              | MA858     |
|                |              | US1090    |
|                |              | DAN401    |
|                |              | MC931     |
|                |              | MI204     |
|                |              | MC921     |
|                |              | ITT310TE  |
|                |              |           |
| Vari-cap       |              | ITT310TE  |
| Varistor       |              | MV13      |
|                |              | MV-5T     |
|                |              | MV203     |
| Zener diode    | N            | SV03YS    |
|                |              | MTZ 3.0JB |
|                |              | MTZ 4.3JC |
|                |              | MTZ 6.2JA |
|                |              | MTZ 7.5JA |
|                |              | MTZ 9.1JB |
|                |              | MTZ 9.1JC |
|                | N            | UZ 3.0B   |
|                | N            | UZ 6.2BL  |
|                | N            | UZ 9.1BL  |
| Thermistor     |              | V06B      |
|                |              | SDT1000   |
|                | N            | 5T41L     |
|                |              | 112-502-2 |
| Surge absorber |              | 32D27     |
|                | N            | DSP-301N  |

| Item       | Re-<br>marks | Name           |
|------------|--------------|----------------|
| Digital Tr | N            | DTC114ES       |
|            |              | DTC143TS       |
|            |              | DTC124ES       |
|            |              | DTC144WS       |
|            |              | DTA114ES       |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
| TR         | N            | 2SA562 (Y)     |
|            |              | 2SA562 TM      |
|            |              | 2SA950 (Y)     |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
| FET        | N            | 2SC1959 (Y)    |
|            |              | 2SC1815 (Y)    |
|            |              | 2SC2053        |
|            |              | 2SC2075        |
|            |              | 2SC2458 (Y)    |
|            |              | 2SC2459 (BL)   |
|            |              | 2SC2509        |
|            |              | 2SC2538        |
|            |              | 2SC2570A       |
|            |              | 2SC2668 (Y)    |
| IC         | N            | 2SC2603 (E)    |
|            |              | 2SC2879        |
|            |              | 2SC3113 (B)    |
|            |              | 2SC2787 (L)    |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              | 2SK30 (GR)     |
|            |              | 2SK30 (O)      |
|            |              | 2SK192 (GR)    |
|            |              | 2SK192A (GR)   |
|            |              | 2SK192A (GR)*J |
|            |              | 2SK125-5       |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              | 3SK73 (GR)     |
|            |              | 3SK74 (L)      |
|            |              | 3SK122 (L)     |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              | AN612          |
|            |              | AN6551         |
|            |              | AN7805         |
|            |              | AN7808         |
|            |              | BA718          |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              | BA6109U2       |
|            |              | BX6124         |
|            |              | BX7191         |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              | HD10116        |
|            |              | HD10131        |
|            |              | HD10125        |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |
|            |              |                |

| Item | Re-<br>marks | Name                 |
|------|--------------|----------------------|
|      | N            | LM2931Z-5.0          |
|      |              |                      |
|      |              |                      |
|      |              |                      |
|      |              |                      |
|      |              |                      |
|      |              |                      |
|      |              |                      |
|      |              |                      |
|      |              |                      |
|      | N            | M54460L              |
|      |              | M54459L              |
|      |              | M54561P              |
|      |              | M74LS00P             |
|      |              | M74LS123P            |
|      |              | M74LS145P            |
|      |              | MB3614               |
|      |              | MB4052               |
|      |              | MB87006              |
|      |              | MBM27128-25JA1       |
|      | N            | MBM8418-20LP-<br>GRA |
|      |              | MC10125L             |
|      |              | MC10131L             |
|      |              | MC10116L             |
|      |              | MC3357P              |
|      |              | MN6147               |
|      |              | MN6147C              |
|      |              |                      |
|      |              |                      |
|      |              |                      |
|      | N            | NE555P               |
|      |              | NJM2903D             |
|      |              | NJM2903S             |
|      |              | NJM2904M             |
|      |              | NJM2094S             |
|      |              |                      |
|      |              |                      |
|      |              |                      |
|      |              |                      |
|      |              |                      |
|      | N            | PST520D              |
|      |              |                      |
|      |              |                      |
|      |              |                      |
|      |              |                      |
|      |              |                      |
|      |              |                      |
|      |              |                      |
|      |              |                      |
|      |              |                      |
|      | N            | SN74LS90N            |
|      |              | SN74LS10N            |
|      |              | SN74LS112N           |
|      |              | SN7404N              |
|      |              | SN74LS123N           |
|      |              | SN74LS00N            |
|      |              | SN74LS138N           |
|      |              | SN74LS145N           |
|      |              | SN16913P             |
|      |              |                      |
|      | N            | TC4001BF             |
|      |              | TC4011BP             |
|      |              | TC4013BP             |
|      |              | TC4030BP             |
|      |              | TC4069UBP            |
|      |              | TMP8255AP-5          |
|      |              |                      |
|      |              |                      |
|      |              |                      |
|      |              |                      |
|      | N            | μPC1158H2            |
|      |              | μPC2002V             |
|      |              | μPC4558C             |
|      |              | μPD6300C             |
|      |              | μPD8255AC-5          |
|      |              | μPD7800G             |
|      |              |                      |
|      |              |                      |
|      |              |                      |
|      |              |                      |

## Destination table

**K** : for U.S.A.  
**M1** : GENERAL MARKET  
**M2** : GENERAL MARKET  
**T** : for England  
**W** : for Europe  
**X** : for Australia

## PARTS LIST

× New Parts

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Teile ohne Parts No. werden nicht geliefert.

| Ref. No.<br>参照番号 | Address<br>位置 | New<br>Parts<br>新 | Parts No.<br>部品番号 | Description<br>部品名/規格          | Desti-<br>nation<br>仕向 | Re-<br>marks<br>備考 |
|------------------|---------------|-------------------|-------------------|--------------------------------|------------------------|--------------------|
| TS-440           |               |                   |                   |                                |                        |                    |
| 1                | 1B            | *                 | A01-0998-02       | CASE (A) UPPER                 |                        |                    |
| 2                | 3A            | *                 | A01-0999-02       | CASE (B) LOWER                 |                        |                    |
| 3                | 2C            | *                 | A20-2556-03       | PANEL ASSY                     |                        |                    |
| 4                | 2B            | *                 | A40-0617-03       | BOTTOM PLATE                   |                        |                    |
| 9                | 1A            |                   | B04-0411-04       | SP MOUNTING HARDWARE           |                        |                    |
| 10               | 1A            |                   | B05-0708-04       | SP GRILL CLOTH                 |                        |                    |
| 11               | 1F            |                   | B30-0817-15       | PILOT LAMP (14V, 80MA)         |                        |                    |
| 12               | 2H            | *                 | B31-0657-05       | METER                          |                        |                    |
| 14               | 3A            | *                 | B40-3625-04       | MODEL NAME PLATE               | KM1M2                  |                    |
| 14               | 3A            | *                 | B40-3625-04       | MODEL NAME PLATE               | TW                     |                    |
| 14               | 3A            | *                 | B40-3626-04       | MODEL NAME PLATE               | X                      |                    |
| 17               | 1A            | *                 | B42-2422-04       | V8X NAME PLATE                 |                        |                    |
| 22               | 2C            | *                 | B43-1063-04       | NAME PLATE (TRIO TS-440S)      | T                      |                    |
| 22               | 2C            | *                 | B43-1064-04       | NAME PLATE (KENWOOD TS-44X)    | X                      |                    |
| 22               | 2C            | *                 | B43-1065-04       | NAME PLATE (KENWOOD TS-440S)   | KM1M2                  |                    |
| 22               | 2C            | *                 | B43-1065-04       | NAME PLATE (KENWOOD TS-440S)   | W                      |                    |
| 23               | 1T            | *                 | B46-0410-10       | WARRANTY CARD                  | K                      |                    |
| 24               | 1S            | *                 | B50-8048-00       | INSTRUCTION MANUAL             | KM1M2                  |                    |
| 24               | 1S            | *                 | B50-8048-00       | INSTRUCTION MANUAL             | WX                     |                    |
| 24               | 1S            | *                 | B50-8049-00       | INSTRUCTION MANUAL             | T                      |                    |
| -                |               |                   | B42-1729-04       | LABEL (WITH ANTENNA TUNER)     |                        |                    |
| 26               | 1S            |                   | E07-0751-05       | 7P DIN PLUG (ACCESSORY)        |                        |                    |
| 27               | 1S            |                   | E07-0852-05       | 8P METAL PLUG                  | KM1M2                  |                    |
| 28               | 1S            |                   | E30-1638-05       | DC POWER CORD ASSY             |                        |                    |
| -                |               |                   | E31-0431-15       | WIRE WITH CONNECTOR (SP)       |                        |                    |
| 30               | 1S            |                   | F05-2034-05       | FUSE (20A)                     |                        |                    |
| 31               | 1S            |                   | F05-2034-05       | FUSE (20A) ACCESSORY           |                        |                    |
| 33               | 3C            |                   | G02-0505-05       | KNOB FIXED SPLING (X4)         |                        |                    |
| -                |               |                   | G53-0509-04       | PACKING (X2) CASE SIDE         |                        |                    |
| 34               | 3S            |                   | H01-4683-04       | CARTON BOX (INSIDE)            | KM1M2                  |                    |
| 34               | 3S            |                   | H01-4683-04       | CARTON BOX (INSIDE)            | W                      |                    |
| 34               | 3S            | *                 | H01-4684-04       | CARTON BOX (INSIDE)            | T                      |                    |
| 34               | 3S            | *                 | H01-4685-04       | CARTON BOX (INSIDE)            | X                      |                    |
| 35               | 3S            | *                 | H03-2278-04       | CARTON BOX (OUT SIDE)          |                        |                    |
| 35               | 3S            | *                 | H03-2278-04       | CARTON BOX (OUT SIDE)          |                        |                    |
| 35               | 3S            | *                 | H03-2285-04       | CARTON BOX (OUT SIDE)          |                        |                    |
| 36               | 2S            | *                 | H10-2615-02       | PACKING FIXTURE (F)            |                        |                    |
| 37               | 1T            | *                 | H10-2616-02       | PACKING FIXTURE (R)            |                        |                    |
| 38               | 1S            |                   | H12-1315-04       | CUSHION                        |                        |                    |
| 39               | 2T            |                   | H20-1425-03       | PROTECTIVE COVER               |                        |                    |
| 40               | 1S            |                   | H25-0079-04       | PROTECTIVE BAG (MIC)           | KM1M2                  |                    |
| 40               | 1S            |                   | H25-0079-04       | PROTECTIVE BAG (MIC)           | X                      |                    |
| 41               | 1S            |                   | H25-0112-04       | PROTECTIVE BAG (DC CORD)       |                        |                    |
| 43               | 3B            |                   | J02-0323-05       | FOOT (X2) R                    |                        |                    |
| 44               | 3A            | *                 | J02-0440-04       | ASSISTANT FOOT                 |                        |                    |
| 45               | 1A, 3A        |                   | J02-0441-05       | FOOT (X4)                      |                        |                    |
| 46               | 3A            |                   | J02-0442-04       | FOOT (X2) F                    |                        |                    |
| 47               | 2A            |                   | J21-1144-34       | MOUNTING HARDWARE (SP)         |                        |                    |
| 48               | 1F            | *                 | J21-2779-14       | MOUNTING HARDWARE (PILOT LAMP) |                        |                    |
| 49               | 2E            |                   | J30-0526-04       | SPACER                         |                        |                    |
| 50               | 2E            |                   | J31-0141-04       | SPACER RING (MIC)              |                        |                    |

## PARTS LIST

\* New Parts

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Teile ohne Parts No. werden nicht geliefert.

| Ref. No.<br>参照番号 | Address<br>位置 | New<br>Parts<br>新 | Parts No.<br>部品番号 | Description<br>部品名 / 規格         | Desti-<br>nation<br>仕 向 | Re-<br>marks<br>備考 |
|------------------|---------------|-------------------|-------------------|---------------------------------|-------------------------|--------------------|
| 55               | 1E            |                   | J32-0765-04       | HEX BOSS (X2) 6.5MM             |                         |                    |
| 56               | 2F            |                   | J32-0782-04       | HEX BOSS (X4) 11MM              |                         |                    |
| 57               | 1F, 1G        | *                 | J32-0792-04       | HEX BOSS (X8) 10MM              |                         |                    |
| 58               | 1G            | *                 | J32-0793-04       | HEX BOSS (X4) 11MM              |                         |                    |
| 59               | 1I, 2J        | *                 | J32-0794-04       | HEX BOSS (X3) 5MM               |                         |                    |
| 63               | 3B            |                   | K01-0407-05       | CARRING HANDLE                  |                         |                    |
| 64               | 3C            | *                 | K21-0778-02       | MAIN KNOB                       |                         |                    |
| 65               | 3C            |                   | K23-0710-04       | KNOB (INSIDE) X4                |                         |                    |
| 66               | 1S            |                   | K23-0712-04       | KNOB (VØX) X1                   |                         |                    |
| 67               | 3C            |                   | K23-0782-04       | KNOB (SELECTIVITY) X1           |                         |                    |
| 68               | 3C            |                   | K29-0741-24       | KNOB (ØUTSIDE) X4               |                         |                    |
| 69               | 2C            |                   | K29-0758-04       | PUSH KNOB (POWER) X1            |                         |                    |
| 70               | 2C            |                   | K29-0782-05       | KNOB (ALC)                      |                         |                    |
| 71               | 2C            |                   | K29-3001-04       | PUSH KNOB (X4)                  |                         |                    |
| 72               | 2C            |                   | K29-3002-04       | PUSH KNOB (X6)                  |                         |                    |
| 75               | 2L            | *                 | N19-0601-14       | FLAT WASHER                     |                         |                    |
| 76               | 2C            |                   | N19-0637-04       | FLAT WASHER (MAIN KNOB)         |                         |                    |
|                  |               |                   | N87-3008-46       | BRAZIER HEAD TAPTITE SCREW(X1)  |                         |                    |
|                  |               |                   | N87-3012-46       | BRAZIER HEAD TAPTITE SCREW(X2)  |                         |                    |
| AA               | 2C, 2E        |                   | N09-0256-05       | GND SCREW (X4)                  |                         |                    |
| BB               | 2H            |                   | N09-0644-04       | BIND SCREW (X6)                 |                         |                    |
| CC               | 2M            |                   | N09-0658-04       | ROUND SCREW (X5)                |                         |                    |
| DD               | 2C, 3C        | *                 | N09-0699-05       | SCREW (X6)                      |                         |                    |
| E                | 2L            |                   | N30-2608-41       | PAN HEAD MACHINE SCREW (X6)     |                         |                    |
| F                | 1E, 1F        |                   | N32-2606-46       | FLAT HEAD MACHINE SCREW (X8)    |                         |                    |
| G                | 2C, 2D        |                   | N32-3004-46       | FLAT HEAD MACHINE SCREW (X4)    |                         |                    |
| H                | 1C, 2D        |                   | N32-3006-46       | FLAT HEAD MACHINE SCREW (X8)    |                         |                    |
| J                | 1A            |                   | N33-3006-41       | ØVAL HEAD MACHINE SCREW (X4) SP |                         |                    |
| K                | 1G, 1I        |                   | N35-2605-46       | BINDING HEAD MACHINE SCREW(X8)  |                         |                    |
| L                | 1A, 3B        |                   | N35-3006-41       | BINDING HEAD MACHINE SCREW(X20) |                         |                    |
| M                | 1C, 1L        |                   | N87-2606-46       | BRAZIER HEAD TAPTITE SCREW(X36) |                         |                    |
| N                | 1C, 2K        |                   | N87-3006-46       | BRAZIER HEAD TAPTITE SCREW(X13) |                         |                    |
| P                | 3A            |                   | N87-3008-41       | BRAZIER HEAD TAPTITE SCREW(X2)  |                         |                    |
| R                | 2L            |                   | N87-3010-41       | BRAZIER HEAD TAPTITE SCREW(X2)  |                         |                    |
| T                | 3D            |                   | N35-3006-46       | BINDING HEAD MACHINE SCREW      |                         |                    |
| U                | 1J            |                   | N30-2604-46       | PAN HEAD MACHINE SCREW          |                         |                    |
| R1               |               |                   | RS14AB3A100J      | FL-PROOF RS 10 J 1W             |                         |                    |
| 79               | 2H            | *                 | S59-0436-05       | KEY BOARD ASSY                  |                         |                    |
| S1               | 1E            |                   | S40-2437-05       | PUSH SWITCH (POWER)             |                         |                    |
| S2               |               |                   | S50-1406-05       | PUSH SWITCH (TACT)              | KM1M2                   |                    |
| S2               |               |                   | S50-1406-05       | PUSH SWITCH (TACT)              | X                       |                    |
| 80               | 2A            |                   | T03-0027-15       | SPEAKER                         |                         |                    |
| 81               | 1S            |                   | T91-0352-05       | MICROPHONE                      | KM1M2                   |                    |
| 81               | 1S            |                   | T91-0352-05       | MICROPHONE                      | X                       |                    |
| 83               | 1F            | *                 | W02-0373-05       | ENCØDER ASSY                    |                         |                    |
| 84               | 1S            |                   | W09-0326-05       | LITHIUM BATTERY                 |                         |                    |
| 88               | 2D, 2G        |                   | X41-1610-00       | SWITCH UNIT                     |                         |                    |
| 89               | 3D            |                   | X44-1680-00       | RF UNIT                         |                         |                    |
| 90               | 2L, 1Ø        |                   | X45-1470-00       | FINAL UNIT                      |                         |                    |
| 91               | 2C            |                   | X50-2050-00       | PLL UNIT                        |                         |                    |
| 92               | 1L            |                   | X51-1340-00       | FILTER UNIT                     |                         |                    |
| 93               | 1I, 2J        | *                 | X53-1450-11       | CØNTRØL UNIT                    | KM1M2                   |                    |

## PARTS LIST

\* New Parts

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Teile ohne Parts No. werden nicht geliefert.

| Ref. No.                  | Address | New<br>Parts | Parts No.   | Description                  | Desti-<br>nation | Re-<br>marks |
|---------------------------|---------|--------------|-------------|------------------------------|------------------|--------------|
| 参照番号                      | 位置      | 新            | 部品番号        | 部品名 / 規格                     | 仕向               | 備考           |
| 93                        | 1I,2J   | *            | X53-1450-11 | CONTROL UNIT                 | WX<br>M2         |              |
| 93                        | 1I,2J   | *            | X53-1450-21 | CONTROL UNIT                 |                  |              |
| 96                        | 1K,1G   | *            | X54-1870-00 | DISPLAY UNIT                 |                  |              |
| 97                        | 2D,1R   | *            | X57-1150-00 | AT UNIT                      |                  |              |
| 98                        | 1D      | *            | X60-1300-00 | IF UNIT                      |                  |              |
| SWITCH UNIT (X41-1610-00) |         |              |             |                              |                  |              |
| C10 ,11                   |         |              | CK45F1H473Z | CERAMIC 0.047UF Z            |                  |              |
| C12                       |         |              | CE04W1C222M | ELECTR0 2200UF 16WV          |                  |              |
| C13                       |         |              | CK45F1H473Z | CERAMIC 0.047UF Z            |                  |              |
| C14                       |         |              | CE04W1C222M | ELECTR0 2200UF 16WV          |                  |              |
| C15                       |         |              | CK45F1H473Z | CERAMIC 0.047UF Z            |                  |              |
| C17                       |         |              | CE04W1C330M | ELECTR0 33UF 16WV            |                  |              |
| C19 ,20                   |         |              | CE04W1C330M | ELECTR0 33UF 16WV            |                  |              |
| C23                       |         |              | CE04W1C330M | ELECTR0 33UF 16WV            |                  |              |
| C24                       |         |              | CE04W1C470M | ELECTR0 47UF 16WV            |                  |              |
| C26                       |         |              | CE04W1C330M | ELECTR0 33UF 16WV            |                  |              |
| C30                       |         |              | CE04W1C470M | ELECTR0 47UF 16WV            |                  |              |
| C31                       |         |              | CE04W1C330M | ELECTR0 33UF 16WV            |                  |              |
| C34                       |         |              | CE04W1C330M | ELECTR0 33UF 16WV            |                  |              |
| C35                       |         |              | C91-0119-05 | CERAMIC 0.047UF K            |                  |              |
| C38                       |         |              | CE04W1C470M | ELECTR0 47UF 16WV            |                  |              |
| C39                       |         |              | C91-0117-05 | CERAMIC 0.01UF K             |                  |              |
| C41                       |         |              | C90-2035-05 | ELECTR0 100UF 16WV           |                  |              |
| C43                       |         |              | CK45F1H473Z | CERAMIC 0.047UF Z            |                  |              |
| C45                       |         |              | C90-2035-05 | ELECTR0 100UF 16WV           |                  |              |
| C46                       |         |              | C092M1H562K | MYLAR 5600PF K               |                  |              |
| C48 -52                   |         |              | C91-0119-05 | CERAMIC 0.047UF K            |                  |              |
| C53                       |         |              | C91-0117-05 | CERAMIC 0.01UF K             |                  |              |
| C55 ,56                   |         |              | C90-2035-05 | ELECTR0 100UF 16WV           |                  |              |
| C57                       |         | *            | C90-2021-05 | ELECTR0 10UF 25WV            |                  |              |
| C59                       |         |              | CK45B1H471K | CERAMIC 470PF K              |                  |              |
| C60 ,61                   |         |              | CK45B1H102K | CERAMIC 1000PF K             |                  |              |
| -                         |         |              | E23-0401-05 | TERMINAL                     |                  |              |
| -                         |         |              | E23-0512-05 | TERMINAL                     |                  |              |
| CN1                       |         |              | E06-0656-05 | 6P DIN CONNECTOR(ACCI)       |                  |              |
| CN2                       |         |              | E11-0413-05 | JACK (PHONES)                |                  |              |
| CN4                       |         |              | E06-0858-05 | 8P METAL SOCKET (MIC)        |                  |              |
| CN4                       |         |              | E11-0414-05 | JACK (EXT SP)                |                  |              |
| CN5                       |         | *            | E11-0418-05 | PHONE JACK (FSK IN,OUT,ACC3) |                  |              |
| CN6                       |         |              | E13-0362-05 | PHONE JACK                   |                  |              |
| MC1                       |         |              | E40-0773-05 | PIN CONNECTOR (MINI,7P)      |                  |              |
| MC2                       |         |              | E40-1073-05 | PIN CONNECTOR (MINI,10P)     |                  |              |
| MC3                       |         |              | E40-1273-05 | PIN CONNECTOR (MINI,12P)     |                  |              |
| MC4                       |         |              | E40-0573-05 | PIN CONNECTOR (MINI,5P)      |                  |              |
| MC8                       |         |              | E40-0373-05 | PIN CONNECTOR (MINI,3P)      |                  |              |
| MC9 ,10                   |         |              | E40-0273-05 | PIN CONNECTOR (MINI,2P)      |                  |              |
| MC12                      |         |              | E40-0873-05 | PIN CONNECTOR (MINI,8P)      |                  |              |
| MC13,14                   |         |              | E40-3237-05 | PIN CONNECTOR (MINI,2P)      |                  |              |
| MC15                      |         |              | E40-3239-05 | PIN CONNECTOR (MINI,4P)      |                  |              |
| MC16                      |         |              | E08-0373-05 | MINI CONNECTOR (3P)          |                  |              |
| MC17                      |         |              | E08-0272-05 | MINI CONNECTOR (2P)          |                  |              |
| MC18                      |         |              | E40-0473-05 | PIN CONNECTOR (MINI,4P)      |                  |              |
| MC19                      |         |              | E40-0373-05 | PIN CONNECTOR (MINI,3P)      |                  |              |
| MC20,21                   |         |              | E40-0473-05 | PIN CONNECTOR (MINI,4P)      |                  |              |

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| Ref. No.<br>参照番号 | Address<br>位置 | New<br>Parts<br>新 | Parts No.<br>部品番号 | Description<br>部品名 / 規格      | Desti-<br>nation<br>仕向 | Re-<br>marks<br>備考 |
|------------------|---------------|-------------------|-------------------|------------------------------|------------------------|--------------------|
| MC22             |               |                   | E40-0673-05       | PIN CONNECTOR (MINI,6P)      |                        |                    |
| MC24             |               |                   | E40-0373-05       | PIN CONNECTOR (MINI,3P)      |                        |                    |
| MC25             |               |                   | E40-5069-05       | PIN CONNECTOR (MINI,6P)      |                        |                    |
| MC27             |               |                   | E40-3241-05       | PIN CONNECTOR (MINI,12P)     |                        |                    |
| MC28             |               |                   | E04-0154-05       | RF COAXIAL CABLE RECEPTACLE  |                        |                    |
| MC29             |               |                   | E40-0273-05       | PIN CONNECTOR (MINI,2P)      |                        |                    |
| MC30             |               |                   | E40-0473-05       | PIN CONNECTOR (MINI,4P)      |                        |                    |
| MC31             |               |                   | E40-0373-05       | PIN CONNECTOR (MINI,3P)      |                        |                    |
| MC32,33          |               |                   | E40-0273-05       | PIN CONNECTOR (MINI,2P)      |                        |                    |
| MC34             |               |                   | E40-0473-05       | PIN CONNECTOR (MINI,4P)      |                        |                    |
| -                |               |                   | F02-0423-04       | HEAT SINK                    |                        |                    |
| CH1              |               |                   | L15-0016-05       | CHOKER COIL                  |                        |                    |
| L1               |               |                   | L40-1011-13       | SMALL FIXED INDUCTOR         |                        |                    |
| L3 -5            |               |                   | L40-1011-14       | SMALL FIXED INDUCTOR         |                        |                    |
| -                |               |                   | N09-0641-05       | SCREW (X4)                   |                        |                    |
| -                |               |                   | N10-2030-46       | HEXAGON NUT (X2)             |                        |                    |
| -                |               |                   | N17-1030-46       | TOOTHED LOCK WASHER (X4)     |                        |                    |
| -                |               |                   | N30-3004-46       | PAN HEAD MACHINE SCREW(X1)   |                        |                    |
| VR1              |               | *                 | R19-3423-05       | POTENTIOMETER (MIC,CAR)      |                        |                    |
| VR2              |               | *                 | R24-9405-05       | POTENTIOMETER (SQ,NOTCH)     |                        |                    |
| VR3              |               |                   | R12-1428-05       | TRIMMING PQT. (1K)RIT        |                        |                    |
| VR4              |               |                   | R12-3450-05       | TRIMMING PQT. (20K)VOLTAGE   |                        |                    |
| VR5              |               |                   | R19-3420-05       | POTENTIOMETER (AF,RF)        |                        |                    |
| VR6              |               |                   | R19-3418-05       | POTENTIOMETER (RIT,IF SHIFT) |                        |                    |
| VR7              |               |                   | R12-1435-05       | TRIMMING PQT. (2K)VCO4       |                        |                    |
| VR10             |               |                   | R12-0405-05       | TRIMMING PQT. (330)          |                        |                    |
| VR11             |               |                   | R12-5402-05       | TRIMMING PQT. (220K)         |                        |                    |
| VR12             |               | *                 | R12-3435-05       | TRIMMING PQT. (47K)          |                        |                    |
| VR13             |               |                   | R12-1418-05       | TRIMMING PQT. (1K)           |                        |                    |
| VR14             |               |                   | R12-1419-05       | TRIMMING PQT. (1K)           |                        |                    |
| W1 ,2            |               |                   | R92-0150-05       | JUMPER REST 0 OHM            |                        |                    |
| W7               |               |                   | R92-0150-05       | JUMPER REST 0 OHM            |                        |                    |
| W13              |               |                   | R92-0150-05       | JUMPER REST 0 OHM            |                        |                    |
| W15              |               |                   | R92-0150-05       | JUMPER REST 0 OHM            |                        |                    |
| RL1              |               | *                 | S51-1429-05       | RELAY                        |                        |                    |
| RL2              |               |                   | S51-1420-05       | RELAY                        |                        |                    |
| S1               |               |                   | S01-2425-05       | ROTARY SWITCH (SELECT)       |                        |                    |
| S2               |               | *                 | S31-4405-05       | SLIDE SWITCH                 |                        |                    |
| D1               |               |                   | 1S1555            | DIODE                        |                        |                    |
| D2               |               |                   | MTZ7.5JA          | ZENER DIODE                  |                        |                    |
| D5 -12           |               |                   | 1SS133            | DIODE                        |                        |                    |
| D13              |               |                   | S31C              | DIODE                        |                        |                    |
| D15 -18          |               |                   | 1SS133            | DIODE                        |                        |                    |
| IC1              |               |                   | AN7808            | IC(VOLTAGE REGULATOR/ +8V)   |                        |                    |
| IC2 ,3           |               |                   | AN7805            | IC(VOLTAGE REGULATOR/ +5V)   |                        |                    |
| IC4              |               | *                 | LM2931Z-5.0       | IC(DROPOUT CONTROL)R/ +5V)   |                        |                    |
| IC5              |               |                   | NJM2904S          | IC(OP AMP X2)                |                        |                    |
| IC6              |               |                   | AN7805            | IC(VOLTAGE REGULATOR/ +5V)   |                        |                    |
| IC7              |               |                   | NJM2903S          | IC(DUAL COMPALATOR)          |                        |                    |
| IC8              |               |                   | NJM2904S          | IC(OP AMP X2)                |                        |                    |
| Q1               |               |                   | DTC114ES          | DIGITAL TRANSISTOR           |                        |                    |
| Q2               |               |                   | 2SD1406(Y)        | TRANSISTOR                   |                        |                    |
| Q3 ,4            |               |                   | 2SK30(GR)         | FET                          |                        |                    |

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werden nicht geliefert.

| dress | New Parts | Parts No.  | Description | Desti-<br>nation | Re-<br>marks |
|-------|-----------|------------|-------------|------------------|--------------|
| 位置    | 新         | 部 品 番 号    | 部 品 名 / 規 格 | 仕 向              | 備考           |
|       |           | 2SC2458(Y) | TRANSISTOR  |                  |              |

## RF UNIT (X44-1680-00)

|  |   |              |         |          |      |  |  |
|--|---|--------------|---------|----------|------|--|--|
|  |   | CC45SL1H390J | CERAMIC | 39PF     | J    |  |  |
|  |   | CC45SL1H121J | CERAMIC | 120PF    | J    |  |  |
|  |   | CC45RH1H330J | CERAMIC | 33PF     | J    |  |  |
|  |   | CK45F1H473Z  | CERAMIC | 0.047UF  | Z    |  |  |
|  |   | C91-1008-05  | CERAMIC | 0.022UF  | K    |  |  |
|  |   | C91-0117-05  | CERAMIC | 0.01UF   | K    |  |  |
|  | * | C91-1065-05  | CERAMIC | 0.0068UF | K    |  |  |
|  |   | C91-0117-05  | CERAMIC | 0.01UF   | K    |  |  |
|  |   | CK45F1H103Z  | CERAMIC | 0.010UF  | Z    |  |  |
|  |   | C91-0117-05  | CERAMIC | 0.01UF   | K    |  |  |
|  |   | C91-0105-05  | CERAMIC | 0.0047UF | K    |  |  |
|  |   | CQ92M1H123K  | MYLAR   | 0.012UF  | K    |  |  |
|  |   | CQ92M1H153K  | MYLAR   | 0.015UF  | K    |  |  |
|  |   | CE04W1H010M  | ELECTRØ | 1.0UF    | 50WV |  |  |
|  |   | C91-1008-05  | CERAMIC | 0.022UF  | K    |  |  |
|  |   | CQ92M1H153K  | MYLAR   | 0.015UF  | K    |  |  |
|  |   | CK45B1H152K  | CERAMIC | 1500PF   | K    |  |  |
|  |   | C91-0125-05  | CERAMIC | 0.0027UF | K    |  |  |
|  |   | CK45B1H152K  | CERAMIC | 1500PF   | K    |  |  |
|  |   | CE04WC1H010M | ELECTRØ | 0.01UF   | C1   |  |  |
|  |   | C91-1008-05  | CERAMIC | 0.022UF  | K    |  |  |
|  |   | CE04WC1H010M | ELECTRØ | 0.01UF   | C1   |  |  |
|  |   | C91-1008-05  | CERAMIC | 0.022UF  | K    |  |  |
|  |   | CK45B1H222K  | CERAMIC | 2200PF   | K    |  |  |
|  |   | CK45B1H821K  | CERAMIC | 820PF    | K    |  |  |
|  | * | C91-1064-05  | CERAMIC | 0.0039UF | K    |  |  |
|  |   | C91-0119-05  | CERAMIC | 0.047UF  | K    |  |  |
|  |   | CK45B1H821K  | CERAMIC | 820PF    | K    |  |  |
|  |   | CE04W1H010M  | ELECTRØ | 1.0UF    | 50WV |  |  |
|  |   | C91-1008-05  | CERAMIC | 0.022UF  | K    |  |  |
|  |   | CK45B1H152K  | CERAMIC | 1500PF   | K    |  |  |
|  |   | CK45B1H681K  | CERAMIC | 680PF    | K    |  |  |
|  | * | C91-1063-05  | CERAMIC | 0.0033UF | K    |  |  |
|  |   | CK45B1H561K  | CERAMIC | 560PF    | K    |  |  |
|  |   | CK45B1H152K  | CERAMIC | 1500PF   | K    |  |  |
|  |   | C91-0119-05  | CERAMIC | 0.047UF  | K    |  |  |
|  |   | CE04W1H010M  | ELECTRØ | 1.0UF    | 50WV |  |  |
|  |   | C91-1008-05  | CERAMIC | 0.022UF  | K    |  |  |
|  |   | CK45B1H182K  | CERAMIC | 1800PF   | K    |  |  |
|  |   | CC45SL1H331J | CERAMIC | 330PF    | J    |  |  |
|  | * | C91-1063-05  | CERAMIC | 0.0033UF | K    |  |  |
|  |   | CC45SL1H271J | CERAMIC | 270PF    | J    |  |  |
|  |   | CK45B1H152K  | CERAMIC | 1500PF   | K    |  |  |
|  |   | C91-0119-05  | CERAMIC | 0.047UF  | K    |  |  |
|  |   | CE04W1H010M  | ELECTRØ | 1.0UF    | 50WV |  |  |
|  |   | C91-1008-05  | CERAMIC | 0.022UF  | K    |  |  |
|  |   | CK45B1H152K  | CERAMIC | 1500PF   | K    |  |  |
|  |   | CC45CH1H101J | CERAMIC | 100PF    | J    |  |  |
|  |   | C91-0125-05  | CERAMIC | 0.0027UF | K    |  |  |
|  |   | CC45SL1H101J | CERAMIC | 100PF    | J    |  |  |
|  |   | CK45B1H122K  | CERAMIC | 1200PF   | K    |  |  |
|  |   | C91-0119-05  | CERAMIC | 0.047UF  | K    |  |  |

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|------------------|---------------|-------------------|-------------------|------------------------------|------------------------|--------------------|
| MC22             |               |                   | E40-0673-05       | PIN CONNECTOR (MINI,6P)      |                        |                    |
| MC24             |               |                   | E40-0373-05       | PIN CONNECTOR (MINI,3P)      |                        |                    |
| MC25             |               |                   | E40-5069-05       | PIN CONNECTOR (MINI,6P)      |                        |                    |
| MC27             |               |                   | E40-3241-05       | PIN CONNECTOR (MINI,12P)     |                        |                    |
| MC28             |               |                   | E04-0154-05       | RF COAXIAL CABLE RECEPTACLE  |                        |                    |
| MC29             |               |                   | E40-0273-05       | PIN CONNECTOR (MINI,2P)      |                        |                    |
| MC30             |               |                   | E40-0473-05       | PIN CONNECTOR (MINI,4P)      |                        |                    |
| MC31             |               |                   | E40-0373-05       | PIN CONNECTOR (MINI,3P)      |                        |                    |
| MC32,33          |               |                   | E40-0273-05       | PIN CONNECTOR (MINI,2P)      |                        |                    |
| MC34             |               |                   | E40-0473-05       | PIN CONNECTOR (MINI,4P)      |                        |                    |
| -                |               |                   | F02-0423-04       | HEAT SINK                    |                        |                    |
| CH1              |               |                   | L15-0016-05       | CHOKER COIL                  |                        |                    |
| L1               |               |                   | L40-1011-13       | SMALL FIXED INDUCTOR         |                        |                    |
| L3 -5            |               |                   | L40-1011-14       | SMALL FIXED INDUCTOR         |                        |                    |
| -                |               |                   | N09-0641-05       | SCREW (X4)                   |                        |                    |
| -                |               |                   | N10-2030-46       | HEXAGON NUT (X2)             |                        |                    |
| -                |               |                   | N17-1030-46       | TOOTHED LOCK WASHER (X4)     |                        |                    |
| -                |               |                   | N30-3004-46       | PAN HEAD MACHINE SCREW(X1)   |                        |                    |
| VR1              |               | *                 | R19-3423-05       | POTENTIOMETER (MIC,CAR)      |                        |                    |
| VR2              |               | *                 | R24-9405-05       | POTENTIOMETER (SQ,NOTCH)     |                        |                    |
| VR3              |               |                   | R12-1428-05       | TRIMMING PNT. (1K)RIT        |                        |                    |
| VR4              |               |                   | R12-3450-05       | TRIMMING PNT. (20K)VOLTAGE   |                        |                    |
| VR5              |               |                   | R19-3420-05       | POTENTIOMETER (AF,RF)        |                        |                    |
| VR6              |               |                   | R19-3418-05       | POTENTIOMETER (RIT,IF SHIFT) |                        |                    |
| VR7              |               |                   | R12-1435-05       | TRIMMING PNT. (2K)VCO4       |                        |                    |
| VR10             |               |                   | R12-0405-05       | TRIMMING PNT. (330)          |                        |                    |
| VR11             |               |                   | R12-5402-05       | TRIMMING PNT. (220K)         |                        |                    |
| VR12             |               | *                 | R12-3435-05       | TRIMMING PNT. (47K)          |                        |                    |
| VR13             |               |                   | R12-1418-05       | TRIMMING PNT. (1K)           |                        |                    |
| VR14             |               |                   | R12-1419-05       | TRIMMING PNT. (1K)           |                        |                    |
| W1 ,2            |               |                   | R92-0150-05       | JUMPER REST 0 OHM            |                        |                    |
| W7               |               |                   | R92-0150-05       | JUMPER REST 0 OHM            |                        |                    |
| W13              |               |                   | R92-0150-05       | JUMPER REST 0 OHM            |                        |                    |
| W15              |               |                   | R92-0150-05       | JUMPER REST 0 OHM            |                        |                    |
| RL1              |               | *                 | S51-1429-05       | RELAY                        |                        |                    |
| RL2              |               |                   | S51-1420-05       | RELAY                        |                        |                    |
| S1               |               |                   | S01-2425-05       | ROTARY SWITCH (SELECT)       |                        |                    |
| S2               |               | *                 | S31-4405-05       | SLIDE SWITCH                 |                        |                    |
| D1               |               |                   | 1S1555            | DIODE                        |                        |                    |
| D2               |               |                   | MTZ7.5JA          | ZENER DIODE                  |                        |                    |
| D5 -12           |               |                   | 1SS133            | DIODE                        |                        |                    |
| D13              |               |                   | S31C              | DIODE                        |                        |                    |
| D15 -18          |               |                   | 1SS133            | DIODE                        |                        |                    |
| IC1              |               |                   | AN7808            | IC(VOLTAGE REGULATOR/ +8V)   |                        |                    |
| IC2 ,3           |               |                   | AN7805            | IC(VOLTAGE REGULATOR/ +5V)   |                        |                    |
| IC4              |               | *                 | LM2931Z-5.0       | IC(DROPOUT CONTROL)R/ +5V)   |                        |                    |
| IC5              |               |                   | NJM2904S          | IC(OP AMP X2)                |                        |                    |
| IC6              |               |                   | AN7805            | IC(VOLTAGE REGULATOR/ +5V)   |                        |                    |
| IC7              |               |                   | NJM2903S          | IC(DUAL COMPALATOR)          |                        |                    |
| IC8              |               |                   | NJM2904S          | IC(OP AMP X2)                |                        |                    |
| Q1               |               |                   | DTC114ES          | DIGITAL TRANSISTOR           |                        |                    |
| Q2               |               |                   | 2SD1406(Y)        | TRANSISTOR                   |                        |                    |
| Q3 ,4            |               |                   | 2SK30(GR)         | FET                          |                        |                    |

R19 EARR pot  
(reg-VR 1)

R19-3423-03



## PARTS LIST

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|------------------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| Q5                           | .6            |                   | 2SC2458(Y)        | TRANSISTOR              |                        |                    |
| <b>RF UNIT (X44-1680-00)</b> |               |                   |                   |                         |                        |                    |
| C1                           |               |                   | CC45SL1H390J      | CERAMIC                 | 39PF                   | J                  |
| C2                           |               |                   | CC45SL1H121J      | CERAMIC                 | 120PF                  | J                  |
| C3                           |               |                   | CC45RH1H330J      | CERAMIC                 | 33PF                   | J                  |
| C4                           |               |                   | CK45F1H473Z       | CERAMIC                 | 0.047UF                | Z                  |
| C6                           |               |                   | C91-1008-05       | CERAMIC                 | 0.022UF                | K                  |
| C7                           |               |                   | C91-0117-05       | CERAMIC                 | 0.01UF                 | K                  |
| C8                           |               | *                 | C91-1065-05       | CERAMIC                 | 0.0068UF               | K                  |
| C9                           | .10           |                   | C91-0117-05       | CERAMIC                 | 0.01UF                 | K                  |
| C11                          |               |                   | CK45F1H103Z       | CERAMIC                 | 0.010UF                | Z                  |
| C12                          |               |                   | C91-0117-05       | CERAMIC                 | 0.01UF                 | K                  |
| C13                          |               |                   | C91-0105-05       | CERAMIC                 | 0.0047UF               | K                  |
| C14                          |               |                   | C092M1H123K       | MYLAR                   | 0.012UF                | K                  |
| C15                          | .16           |                   | C092M1H153K       | MYLAR                   | 0.015UF                | K                  |
| C17                          |               |                   | CE04W1H010M       | ELECTR0                 | 1.0UF                  | 50WV               |
| C18                          |               |                   | C91-1008-05       | CERAMIC                 | 0.022UF                | K                  |
| C19                          | .20           |                   | C092M1H153K       | MYLAR                   | 0.015UF                | K                  |
| C21                          |               |                   | CK45B1H152K       | CERAMIC                 | 1500PF                 | K                  |
| C22                          |               |                   | C91-0125-05       | CERAMIC                 | 0.0027UF               | K                  |
| C23                          |               |                   | CK45B1H152K       | CERAMIC                 | 1500PF                 | K                  |
| C24                          |               |                   | CE04WC1H010M      | ELECTR0                 | H01UF                  | C1                 |
| C25                          |               |                   | C91-1008-05       | CERAMIC                 | 0.022UF                | K                  |
| C26                          |               |                   | CE04WC1H010M      | ELECTR0                 | H01UF                  | C1                 |
| C27                          |               |                   | C91-1008-05       | CERAMIC                 | 0.022UF                | K                  |
| C28                          | .29           |                   | CK45B1H222K       | CERAMIC                 | 2200PF                 | K                  |
| C30                          |               |                   | CK45B1H821K       | CERAMIC                 | 820PF                  | K                  |
| C31                          |               | *                 | C91-1064-05       | CERAMIC                 | 0.0039UF               | K                  |
| C32                          |               |                   | C91-0119-05       | CERAMIC                 | 0.047UF                | K                  |
| C33                          |               |                   | CK45B1H821K       | CERAMIC                 | 820PF                  | K                  |
| C34                          |               |                   | CE04W1H010M       | ELECTR0                 | 1.0UF                  | 50WV               |
| C35                          |               |                   | C91-1008-05       | CERAMIC                 | 0.022UF                | K                  |
| C37                          |               |                   | CK45B1H152K       | CERAMIC                 | 1500PF                 | K                  |
| C38                          |               |                   | CK45B1H681K       | CERAMIC                 | 680PF                  | K                  |
| C39                          |               | *                 | C91-1063-05       | CERAMIC                 | 0.0033UF               | K                  |
| C40                          |               |                   | CK45B1H561K       | CERAMIC                 | 560PF                  | K                  |
| C41                          |               |                   | CK45B1H152K       | CERAMIC                 | 1500PF                 | K                  |
| C42                          |               |                   | C91-0119-05       | CERAMIC                 | 0.047UF                | K                  |
| C43                          |               |                   | CE04W1H010M       | ELECTR0                 | 1.0UF                  | 50WV               |
| C44                          |               |                   | C91-1008-05       | CERAMIC                 | 0.022UF                | K                  |
| C45                          |               |                   | CK45B1H182K       | CERAMIC                 | 1800PF                 | K                  |
| C46                          |               |                   | CC45SL1H331J      | CERAMIC                 | 330PF                  | J                  |
| C47                          |               | *                 | C91-1063-05       | CERAMIC                 | 0.0033UF               | K                  |
| C48                          |               |                   | CC45SL1H271J      | CERAMIC                 | 270PF                  | J                  |
| C49                          |               |                   | CK45B1H152K       | CERAMIC                 | 1500PF                 | K                  |
| C50                          |               |                   | C91-0119-05       | CERAMIC                 | 0.047UF                | K                  |
| C51                          |               |                   | CE04W1H010M       | ELECTR0                 | 1.0UF                  | 50WV               |
| C52                          |               |                   | C91-1008-05       | CERAMIC                 | 0.022UF                | K                  |
| C53                          |               |                   | CK45B1H152K       | CERAMIC                 | 1500PF                 | K                  |
| C54                          |               |                   | CC45CH1H101J      | CERAMIC                 | 100PF                  | J                  |
| C55                          |               |                   | C91-0125-05       | CERAMIC                 | 0.0027UF               | K                  |
| C56                          |               |                   | CC45SL1H101J      | CERAMIC                 | 100PF                  | J                  |
| C57                          |               |                   | CK45B1H122K       | CERAMIC                 | 1200PF                 | K                  |
| C58                          |               |                   | C91-0119-05       | CERAMIC                 | 0.047UF                | K                  |

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|------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| C59              |               |                   | CE04W1H010M       | ELECTR0 1.0UF 50WV      |                        |                    |
| C60              |               |                   | C91-1008-05       | CERAMIC 0.022UF K       |                        |                    |
| C61              |               |                   | CK45B1H681K       | CERAMIC 680PF K         |                        |                    |
| C62              |               |                   | CC45SL1H151J      | CERAMIC 150PF J         |                        |                    |
| C63              |               |                   | CK45B1H152K       | CERAMIC 1500PF K        |                        |                    |
| C64              |               |                   | CC45SL1H151J      | CERAMIC 150PF J         |                        |                    |
| C65              |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C66              |               |                   | CE04W1H010M       | ELECTR0 1.0UF 50WV      |                        |                    |
| C67              |               |                   | C91-1008-05       | CERAMIC 0.022UF K       |                        |                    |
| C68              |               |                   | CK45B1H471K       | CERAMIC 470PF K         |                        |                    |
| C69              |               | *                 | CC45SL1H111J      | CERAMIC 110PF J         |                        |                    |
| C70              |               |                   | CK45B1H821K       | CERAMIC 820PF K         |                        |                    |
| C71              |               |                   | CC45SL1H151J      | CERAMIC 150PF J         |                        |                    |
| C72              |               |                   | CK45B1H471K       | CERAMIC 470PF K         |                        |                    |
| C73              |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C74              |               |                   | CE04W1H010M       | ELECTR0 1.0UF 50WV      |                        |                    |
| C75              |               |                   | C91-1008-05       | CERAMIC 0.022UF K       |                        |                    |
| C76              |               |                   | CC45SL1H221J      | CERAMIC 220PF J         |                        |                    |
| C77              |               |                   | CC45SL1H910J      | CERAMIC 91PF J          |                        |                    |
| C78              |               |                   | CK45B1H681K       | CERAMIC 680PF K         |                        |                    |
| C79              |               |                   | CC45SL1H910J      | CERAMIC 91PF J          |                        |                    |
| C80              |               |                   | CC45SL1H331J      | CERAMIC 330PF J         |                        |                    |
| C81              |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C82              |               |                   | CE04W1H010M       | ELECTR0 1.0UF 50WV      |                        |                    |
| C83              |               |                   | C91-1008-05       | CERAMIC 0.022UF K       |                        |                    |
| C84              |               |                   | CC45SL1H121J      | CERAMIC 120PF J         |                        |                    |
| C85 ,86          |               |                   | CC45SL1H470J      | CERAMIC 47PF J          |                        |                    |
| C87              |               |                   | CC45SL1H080D      | CERAMIC 8.0PF D         |                        |                    |
| C88              |               |                   | CC45SL1H820J      | CERAMIC 82PF J          |                        |                    |
| C89              |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C90              |               |                   | CE04W1H010M       | ELECTR0 1.0UF 50WV      |                        |                    |
| C91              |               |                   | C91-1008-05       | CERAMIC 0.022UF K       |                        |                    |
| C92              |               | *                 | CE04WC1H010M      | ELECTR0 H01UF C1        |                        |                    |
| C93              |               |                   | C91-1008-05       | CERAMIC 0.022UF K       |                        |                    |
| C94              |               |                   | CC45SL1H680J      | CERAMIC 68PF J          |                        |                    |
| C95              |               |                   | CK45B1H181K       | CERAMIC 180PF K         |                        |                    |
| C96              |               |                   | C91-1008-05       | CERAMIC 0.022UF K       |                        |                    |
| C97 ,98          |               |                   | C91-0105-05       | CERAMIC 0.0047UF K      |                        |                    |
| C99 ,100         |               |                   | C91-1008-05       | CERAMIC 0.022UF K       |                        |                    |
| C101             |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C103             |               |                   | CC45SL1H330J      | CERAMIC 33PF J          |                        |                    |
| C104             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C105             |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C106-108         |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C109             |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C110             |               |                   | C91-1008-05       | CERAMIC 0.022UF K       |                        |                    |
| C111             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C112             |               |                   | CK45B1H102K       | CERAMIC 1000PF K        |                        |                    |
| C113             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C114             |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C115,116         |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C117             |               |                   | C91-1008-05       | CERAMIC 0.022UF K       |                        |                    |
| C118             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C119             |               |                   | C91-0757-05       | CERAMIC 0.001UF K       |                        |                    |
| C120             |               |                   | CC45SL1H470J      | CERAMIC 47PF J          |                        |                    |

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|------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| C121             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C122             |               |                   | CC45SL1H470J      | CERAMIC 47PF J          |                        |                    |
| C123             |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C124             |               |                   | CC45SL1H100D      | CERAMIC 10PF D          |                        |                    |
| C125             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C126             |               |                   | CE04W1H100M       | ELECTR0 10UF 50WV       |                        |                    |
| C127             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C128             |               |                   | CC45SL1H040C      | CERAMIC 4.0PF C         |                        |                    |
| C129-132         |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C133             |               |                   | CC45SL1H101J      | CERAMIC 100PF J         |                        |                    |
| C134             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C135             |               |                   | CC45SL1H121J      | CERAMIC 120PF J         |                        |                    |
| C136             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C137             |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C138-142         |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C143-145         |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C146             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C147,148         |               |                   | C91-1008-05       | CERAMIC 0.022UF K       |                        |                    |
| C149,150         |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C151             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C153             |               |                   | C91-1008-05       | CERAMIC 0.022UF K       |                        |                    |
| C154,155         |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C156             |               |                   | CC45RH1H020C      | CERAMIC 2.0PF C         |                        |                    |
| C157             |               |                   | C91-1008-05       | CERAMIC 0.022UF K       |                        |                    |
| C158             |               |                   | CC45SL1H100D      | CERAMIC 10PF D          |                        |                    |
| C159             |               |                   | CC45SL1H120J      | CERAMIC 12PF J          |                        |                    |
| C160             |               |                   | C91-1008-05       | CERAMIC 0.022UF K       |                        |                    |
| C161             |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C162             |               |                   | CE04W1H2R2M       | ELECTR0 2.2UF 50WV      |                        |                    |
| C163             |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C164             |               |                   | CK45B1H181K       | CERAMIC 180PF K         |                        |                    |
| C165             |               |                   | CK45B1H331K       | CERAMIC 330PF K         |                        |                    |
| C166             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C166,167         |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C168             |               |                   | CE04W1H100M       | ELECTR0 10UF 50WV       |                        |                    |
| C169             |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C170             |               |                   | CE04W1A470M       | ELECTR0 47UF 10WV       |                        |                    |
| C171             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C172             |               |                   | CE04W1A470M       | ELECTR0 47UF 10WV       |                        |                    |
| C173             |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C174             |               |                   | CC45TH1H390J      | CERAMIC 39PF J          |                        |                    |
| C175             |               |                   | CC45CH1H050C      | CERAMIC 5.0PF C         |                        |                    |
| C176             |               |                   | CC45CH1H330J      | CERAMIC 33PF J          |                        |                    |
| C177             |               | *                 | C91-0727-05       | CERAMIC 18PF J          |                        |                    |
| C178             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C179             |               |                   | CE04W1A470M       | ELECTR0 47UF 10WV       |                        |                    |
| C180             |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C181             |               | *                 | CC45SH1H470J      | CERAMIC 47PF J          |                        |                    |
| C182             |               |                   | CC45CH1H050C      | CERAMIC 5.0PF C         |                        |                    |
| C183             |               |                   | CC45CH1H330J      | CERAMIC 33PF J          |                        |                    |
| C184             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C185             |               |                   | CE04W1A470M       | ELECTR0 47UF 10WV       |                        |                    |
| C186             |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C187             |               |                   | CC45RH1H560J      | CERAMIC 56PF J          |                        |                    |
| C188             |               |                   | CC45CH1H050C      | CERAMIC 5.0PF C         |                        |                    |

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|------------------|---------------|-------------------|-------------------|--------------------------------|------------------------|--------------------|
| C189             |               |                   | CC45CH1H330J      | CERAMIC 33PF J                 |                        |                    |
| C190, 191        |               |                   | C91-0117-05       | CERAMIC 0.01UF K               |                        |                    |
| C192             |               |                   | CE04W1A470M       | ELECTR0 47UF 10WV              |                        |                    |
| C193             |               |                   | C91-0769-05       | CERAMIC 0.01UF M               |                        |                    |
| C194             |               |                   | CC45RH1H680J      | CERAMIC 68PF J                 |                        |                    |
| C195             |               |                   | CC45CH1H050C      | CERAMIC 5.0PF C                |                        |                    |
| C196             |               |                   | CC45CH1H330J      | CERAMIC 33PF J                 |                        |                    |
| C197             |               |                   | CC45CH1H050C      | CERAMIC 5.0PF C                |                        |                    |
| C198             |               |                   | CK45F1H103Z       | CERAMIC 0.010UF Z              |                        |                    |
| C199             |               |                   | CC45SL1H220J      | CERAMIC 22PF J                 |                        |                    |
| C200             |               |                   | C91-0117-05       | CERAMIC 0.01UF K               |                        |                    |
| C202             |               |                   | CC45SL1H330J      | CERAMIC 33PF J                 |                        |                    |
| C203             |               |                   | C91-0119-05       | CERAMIC 0.047UF K              |                        |                    |
| C204             |               |                   | C91-0117-05       | CERAMIC 0.01UF K               |                        |                    |
| C205             |               |                   | C91-0747-05       | CERAMIC 150PF K                |                        |                    |
| C206             |               |                   | CC45SL1H270J      | CERAMIC 27PF J                 |                        |                    |
| C207             |               |                   | CC45SL1H331J      | CERAMIC 330PF J                |                        |                    |
| C208             |               |                   | CC45SL1H470J      | CERAMIC 47PF J                 |                        |                    |
| C209-213         |               |                   | C91-0117-05       | CERAMIC 0.01UF K               |                        |                    |
| C214             |               | *                 | C91-0714-05       | CERAMIC 2.7PF K                |                        |                    |
| C215, 216        |               |                   | C91-0117-05       | CERAMIC 0.01UF K               |                        |                    |
| C217             |               |                   | CK45B1H102K       | CERAMIC 1000PF K               |                        |                    |
| C218             |               |                   | CK45B1H331K       | CERAMIC 330PF K                |                        |                    |
| C219             |               |                   | CE04W1H010M       | ELECTR0 1.0UF 50WV             |                        |                    |
| C220             |               |                   | C91-0117-05       | CERAMIC 0.01UF K               |                        |                    |
| C221             |               |                   | C91-0117-05       | CERAMIC 0.01UF K               |                        |                    |
| C222, 223        |               |                   | C91-0119-05       | CERAMIC 0.047UF K              |                        |                    |
| C224             |               |                   | CE04W1H010M       | ELECTR0 1.0UF 50WV             |                        |                    |
| C225             |               |                   | C91-0117-05       | CERAMIC 0.01UF K               |                        |                    |
| C226             |               |                   | CE04W1H010M       | ELECTR0 1.0UF 50WV             |                        |                    |
| C227             |               |                   | CC45SL1H101J      | CERAMIC 100PF J                |                        |                    |
| C228             |               |                   | C91-0117-05       | CERAMIC 0.01UF K               |                        |                    |
| C229             |               |                   | CS15E1VR47M       | TANTAL 0.47UF 35WV             |                        |                    |
| C230             |               |                   | CQ92M1H392K       | MYLAR 3900PF K                 |                        |                    |
| C231             |               |                   | CE04W1A470M       | ELECTR0 47UF 10WV              |                        |                    |
| C232             |               |                   | CE04W1H0R1M       | ELECTR0 0.1UF 50WV             |                        |                    |
| C233             |               |                   | CK45B1H471K       | CERAMIC 470PF K                |                        |                    |
| C235             |               |                   | CE04W1H100M       | ELECTR0 10UF 50WV              |                        |                    |
| C236             |               |                   | CQ92M1H333K       | MYLAR 0.033UF K                |                        |                    |
| C237             |               |                   | CE04W1H100M       | ELECTR0 10UF 50WV              |                        |                    |
| C238             |               |                   | CS15E1A2R2M       | TANTAL 2.2UF 10WV              |                        |                    |
| C239             |               |                   | CQ92M1H102K       | MYLAR 1000PF K                 |                        |                    |
| C240             |               |                   | CQ92M1H123K       | MYLAR 0.012UF K                |                        |                    |
| C241             |               |                   | CK45F1H223Z       | CERAMIC 0.022UF Z              |                        |                    |
| C242-247         |               |                   | C91-0769-05       | CERAMIC 0.01UF M               |                        |                    |
| C249             |               |                   | CC45SL1H470J      | CERAMIC 47PF J                 |                        |                    |
| C250             |               |                   | CC45RH1H020C      | CERAMIC 2.0PF C                |                        |                    |
| C251             |               |                   | C91-0119-05       | CERAMIC 0.047UF K              |                        |                    |
| C252             |               | *                 | CE04WC1H010M      | ELECTR0 H01UF C1               |                        |                    |
| C253, 254        |               |                   | C91-1008-05       | CERAMIC 0.022UF K              |                        |                    |
| TC1              |               |                   | C05-0328-05       | TRIMMING CAP (50PF)            |                        |                    |
| -                |               |                   | E04-0157-05       | RF COAXIAL CABLE RECEPTACLE(X3 |                        |                    |
| -                |               |                   | E23-0512-05       | TERMINAL                       |                        |                    |
| -                |               |                   | E31-1448-05       | CONNECTING WIRE                |                        |                    |

## PARTS LIST

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|------------------|---------------|-------------------|-------------------|-------------------------------|------------------------|--------------------|
| J1               |               |                   | E40-1173-05       | PIN CONNECTOR                 |                        |                    |
| J2               |               |                   | E40-0473-05       | PIN CONNECTOR (MINI, 4P)      |                        |                    |
| J3 ,4            |               |                   | E40-0273-05       | PIN CONNECTOR (MINI, 2P)      |                        |                    |
| J6               |               |                   | E40-0573-05       | PIN CONNECTOR                 |                        |                    |
| J7 -9            |               |                   | E40-0273-05       | PIN CONNECTOR (MINI, 2P)      |                        |                    |
| J11              |               |                   | E40-0273-05       | PIN CONNECTOR (MINI, 2P)      |                        |                    |
| J12              |               |                   | E40-0473-05       | PIN CONNECTOR (MINI, 4P)      |                        |                    |
| J14              |               |                   | E40-0373-05       | PIN CONNECTOR (MINI, 3P)      |                        |                    |
| J14              |               |                   | E40-0673-05       | PIN CONNECTOR                 |                        |                    |
| J15 ,16          |               |                   | E40-0473-05       | PIN CONNECTOR (MINI, 4P)      |                        |                    |
| -                |               |                   | J32-0795-04       | HEX BOSS                      |                        |                    |
| -                |               |                   | L92-0110-05       | BEAD CORE (FOR L77, L78)      |                        |                    |
| F1               |               | *                 | L71-0259-05       | CRYSTAL FILTER (45.05MHZ)     |                        |                    |
| F2               |               | *                 | L71-0260-05       | CRYSTAL FILTER (8.83MHZ)      |                        |                    |
| L1               |               |                   | L40-1511-13       | SMALL FIXED INDUCTOR (150UH)  |                        |                    |
| L3               |               |                   | L40-3382-14       | SMALL FIXED INDUCTOR (0.33UH) |                        |                    |
| L4               |               |                   | L40-2282-14       | SMALL FIXED INDUCTOR (0.22UH) |                        |                    |
| L5 -8            |               |                   | L40-2292-14       | SMALL FIXED INDUCTOR (1.2UH)  |                        |                    |
| L9               |               |                   | L40-1011-13       | SMALL FIXED INDUCTOR (100UH)  |                        |                    |
| L10              |               |                   | L40-1021-03       | SMALL FIXED INDUCTOR (1MHZ)   |                        |                    |
| L11              |               |                   | L40-1021-13       | SMALL FIXED INDUCTOR (1MHZ)   |                        |                    |
| L12 ,13          |               |                   | L40-2701-14       | SMALL FIXED INDUCTOR (27UH)   |                        |                    |
| L14              |               |                   | L40-2201-14       | SMALL FIXED INDUCTOR (22UH)   |                        |                    |
| L15 ,16          |               |                   | L40-4701-14       | SMALL FIXED INDUCTOR (47UH)   |                        |                    |
| L17              |               |                   | L40-1001-14       | SMALL FIXED INDUCTOR (10UH)   |                        |                    |
| L18              |               |                   | L40-8291-14       | SMALL FIXED INDUCTOR (8.2UH)  |                        |                    |
| L20              |               |                   | L40-8291-14       | SMALL FIXED INDUCTOR (8.2UH)  |                        |                    |
| L21              |               |                   | L40-2792-14       | SMALL FIXED INDUCTOR (2.7UH)  |                        |                    |
| L22              |               |                   | L40-1592-14       | SMALL FIXED INDUCTOR (1.5UH)  |                        |                    |
| L23              |               |                   | L40-8291-14       | SMALL FIXED INDUCTOR (8.2UH)  |                        |                    |
| L24              |               |                   | L40-1021-13       | SMALL FIXED INDUCTOR (1MHZ)   |                        |                    |
| L25              |               |                   | L40-2792-14       | SMALL FIXED INDUCTOR (2.7UH)  |                        |                    |
| L26 ,27          |               |                   | L40-5691-14       | SMALL FIXED INDUCTOR (5.6UH)  |                        |                    |
| L28              |               |                   | L40-1892-14       | SMALL FIXED INDUCTOR (1.8UH)  |                        |                    |
| L29              |               |                   | L40-1092-14       | SMALL FIXED INDUCTOR (1UHZ)   |                        |                    |
| L30              |               |                   | L40-1892-14       | SMALL FIXED INDUCTOR (1.8UH)  |                        |                    |
| L31              |               |                   | L40-1021-13       | SMALL FIXED INDUCTOR (1MHZ)   |                        |                    |
| L32 ,33          |               |                   | L40-3991-14       | SMALL FIXED INDUCTOR (3.9UH)  |                        |                    |
| L34              |               |                   | L40-6882-14       | SMALL FIXED INDUCTOR (0.68UH) |                        |                    |
| L35              |               |                   | L40-3982-14       | SMALL FIXED INDUCTOR (0.39UH) |                        |                    |
| L36              |               |                   | L40-6882-14       | SMALL FIXED INDUCTOR (0.68UH) |                        |                    |
| L37              |               |                   | L40-1021-13       | SMALL FIXED INDUCTOR (1MHZ)   |                        |                    |
| L38 ,39          |               |                   | L40-5691-14       | SMALL FIXED INDUCTOR (5.6UH)  |                        |                    |
| L40              |               |                   | L40-3982-14       | SMALL FIXED INDUCTOR (0.39UH) |                        |                    |
| L41              |               |                   | L40-2282-14       | SMALL FIXED INDUCTOR (0.22UH) |                        |                    |
| L42              |               |                   | L40-3982-14       | SMALL FIXED INDUCTOR (0.39UH) |                        |                    |
| L43              |               |                   | L40-1021-13       | SMALL FIXED INDUCTOR (1MHZ)   |                        |                    |
| L44 ,45          |               |                   | L40-2292-14       | SMALL FIXED INDUCTOR (1.2UH)  |                        |                    |
| L46              |               |                   | L40-4782-14       | SMALL FIXED INDUCTOR (0.47UH) |                        |                    |
| L47              |               | *                 | L40-2782-14       | SMALL FIXED INDUCTOR (0.27UH) |                        |                    |
| L48              |               |                   | L40-4782-14       | SMALL FIXED INDUCTOR (0.47UH) |                        |                    |
| L49              |               |                   | L40-1021-13       | SMALL FIXED INDUCTOR (1MHZ)   |                        |                    |
| L50              |               |                   | L40-1592-14       | SMALL FIXED INDUCTOR (1.5UH)  |                        |                    |
| L51              |               |                   | L40-1092-14       | SMALL FIXED INDUCTOR (1UHZ)   |                        |                    |

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|------------------|----------------|-------------------|----------------------|-------------------------------|-------------------------|--------------------|
| L52              |                |                   | L40-3982-14          | SMALL FIXED INDUCTOR (0.39UH) |                         |                    |
| L53              |                |                   | L40-2282-14          | SMALL FIXED INDUCTOR (0.22UH) |                         |                    |
| L54              |                |                   | L40-3982-14          | SMALL FIXED INDUCTOR (0.39UH) |                         |                    |
| L55              |                |                   | L40-1021-13          | SMALL FIXED INDUCTOR (1MHZ)   |                         |                    |
| L56 ,57          |                |                   | L40-1092-14          | SMALL FIXED INDUCTOR (1UHZ)   |                         |                    |
| L58              |                |                   | L40-3982-14          | SMALL FIXED INDUCTOR (0.39UH) |                         |                    |
| L59              |                | *                 | L34-1163-05          | COIL                          |                         |                    |
| L60              |                |                   | L40-3982-14          | SMALL FIXED INDUCTOR (0.39UH) |                         |                    |
| L61              |                |                   | L40-1021-13          | SMALL FIXED INDUCTOR (1MHZ)   |                         |                    |
| L62              |                | *                 | L40-2782-14          | SMALL FIXED INDUCTOR (0.27UH) |                         |                    |
| L63              |                |                   | L40-8282-14          | SMALL FIXED INDUCTOR (0.82UH) |                         |                    |
| L64              |                |                   | L40-2282-14          | SMALL FIXED INDUCTOR (0.22UH) |                         |                    |
| L65              |                |                   | L40-3982-14          | SMALL FIXED INDUCTOR (0.39UH) |                         |                    |
| L66              |                |                   | L40-1021-13          | SMALL FIXED INDUCTOR (1MHZ)   |                         |                    |
| L67              |                |                   | L40-1021-03          | SMALL FIXED INDUCTOR (1MHZ)   |                         |                    |
| L68              |                |                   | L40-2211-03          | SMALL FIXED INDUCTOR          |                         |                    |
| L69              |                |                   | L40-3382-14          | SMALL FIXED INDUCTOR (0.33UH) |                         |                    |
| L70              |                |                   | L40-1011-14          | SMALL FIXED INDUCTOR (100UH)  |                         |                    |
| L71              |                |                   | L40-4701-03          | SMALL FIXED INDUCTOR (47UH)   |                         |                    |
| L72 -76          |                |                   | L40-1011-14          | SMALL FIXED INDUCTOR (100UH)  |                         |                    |
| L79 -84          |                |                   | L40-1011-14          | SMALL FIXED INDUCTOR (100UH)  |                         |                    |
| L86              |                |                   | L40-1011-14          | SMALL FIXED INDUCTOR (100UH)  |                         |                    |
| L87              |                |                   | L40-2201-14          | SMALL FIXED INDUCTOR (22UH)   |                         |                    |
| L88              |                |                   | L40-6891-14          | SMALL FIXED INDUCTOR (6.8UH)  |                         |                    |
| L89              |                |                   | L40-2292-14          | SMALL FIXED INDUCTOR (1.2UH)  |                         |                    |
| L90              |                | *                 | L34-1162-05          | COIL                          |                         |                    |
| L91              |                |                   | L40-1011-14          | SMALL FIXED INDUCTOR (100UH)  |                         |                    |
| L92              |                | *                 | L40-6891-14          | SMALL FIXED INDUCTOR (6.8UH)  |                         |                    |
| L93 -96          |                |                   | L40-4701-14          | SMALL FIXED INDUCTOR (47UH)   |                         |                    |
| L97              |                |                   | L40-1011-14          | SMALL FIXED INDUCTOR (100UH)  |                         |                    |
| L98              |                |                   | L40-1511-14          | SMALL FIXED INDUCTOR (150UH)  |                         |                    |
| L99 -84          |                |                   | L40-1011-14          | SMALL FIXED INDUCTOR (100UH)  |                         |                    |
| L100             |                |                   | L40-4782-14          | SMALL FIXED INDUCTOR (0.47UH) |                         |                    |
| L101             |                |                   | L40-1011-14          | SMALL FIXED INDUCTOR (100UH)  |                         |                    |
| L102             |                |                   | L40-3382-14          | SMALL FIXED INDUCTOR (0.33UH) |                         |                    |
| L103             |                |                   | L40-2282-14          | SMALL FIXED INDUCTOR (0.22UH) |                         |                    |
| L104 ,105        |                |                   | L40-3382-14          | SMALL FIXED INDUCTOR (0.33UH) |                         |                    |
| L106             |                |                   | L40-1511-14          | SMALL FIXED INDUCTOR (150UH)  |                         |                    |
| L107             |                |                   | L40-1021-13          | SMALL FIXED INDUCTOR (1MHZ)   |                         |                    |
| L108             |                |                   | L40-1011-14          | SMALL FIXED INDUCTOR (100UH)  |                         |                    |
| L109             |                |                   | L40-1011-13          | SMALL FIXED INDUCTOR (100UH)  |                         |                    |
| L110-111         |                |                   | L40-1011-14          | SMALL FIXED INDUCTOR (100UH)  |                         |                    |
| L112-115         |                |                   | L40-4701-13          | SMALL FIXED INDUCTOR (47UH)   |                         |                    |
| T1               |                | *                 | L34-2266-05          | COIL (45.05MHZ)               |                         |                    |
| T2               |                | *                 | L19-0361-05          | BALUN TRANSFORMER (RX MIX)    |                         |                    |
| T3               |                |                   | L34-2267-05          | COIL (45.05MHZ)               |                         |                    |
| T4               |                |                   | L34-2268-05          | COIL (45.05MHZ)               |                         |                    |
| T5               |                |                   | L34-2145-05          | COIL (45.05MHZ)               |                         |                    |
| T6               |                | *                 | L34-2283-05          | COIL (45.05MHZ)               |                         |                    |
| T7               |                |                   | L34-2267-05          | COIL (45.05MHZ)               |                         |                    |
| T8               |                |                   | L30-0506-05          | IFT (8.83MHZ)                 |                         |                    |
| T9               |                |                   | L34-2159-05          | COIL (8.83MHZ)                |                         |                    |
| T10 ,11          |                |                   | L34-0942-05          | COIL (8.83MHZ)                |                         |                    |
| T12              |                | *                 | L34-2284-05          | COIL (8.83MHZ)                |                         |                    |
| T13              |                | *                 | L34-2285-05          | COIL (8.83MHZ)                |                         |                    |

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|------------------|---------------|-------------------|-------------------|---------------------------------|-------------------------|--------------------|
| T14              |               | *                 | L34-2286-05       | COIL (36.22MHZ)                 |                         |                    |
| T15              |               | *                 | L34-2287-05       | COIL (36.22MHZ)                 |                         |                    |
| T16              |               | *                 | L34-2288-05       | COIL (45.05MHZ)                 |                         |                    |
| T17              |               | *                 | L34-2289-05       | COIL (45.05MHZ)                 |                         |                    |
| T18 ,19          |               |                   | L19-0324-05       | BALUN TRANSFORMER(TX MIX,DRIVE) |                         |                    |
| T20              |               | *                 | L19-0362-05       | BALUN TRANSFORMER(TX DRIVE)     |                         |                    |
| T21 ,22          |               | *                 | L34-2290-05       | COIL (VCO,HH.H)                 |                         |                    |
| T23              |               | *                 | L34-2277-05       | COIL (VCO L)                    |                         |                    |
| T24              |               | *                 | L34-2278-05       | COIL (VCO LL)                   |                         |                    |
| T25              |               |                   | L19-0344-05       | BALUN TRANSFORMER(PLL)          |                         |                    |
| T26              |               |                   | L34-0535-05       | COIL (8.83MHZ)                  |                         |                    |
| T27              |               |                   | L34-0536-05       | COIL (8.83MHZ)                  |                         |                    |
| -                |               |                   | N10-2026-46       | HEX NUT                         |                         |                    |
| IB1              |               |                   | R90-0188-05       | MULTI-COMP 0.01UF X4            |                         |                    |
| R184             |               | *                 | R90-0454-05       | MULTI-COMP                      |                         |                    |
| VR1              |               | *                 | R12-0435-05       | TRIMMING PQT.(1ST MIX BALANCE)  |                         |                    |
| VR2              |               |                   | R12-1431-05       | TRIMMING PQT.(2ND MIX BALANCE)  |                         |                    |
| VR3              |               |                   | R12-4413-05       | TRIMMING PQT.(FM DEV)           |                         |                    |
| VR4              |               |                   | R12-1431-05       | TRIMMING PQT.(SQUARIOUS)        |                         |                    |
| VR5              |               |                   | R12-4414-05       | TRIMMING PQT.(TX AMP)           |                         |                    |
| VR6              |               |                   | R12-3447-05       | TRIMMING PQT.(FM DEV)           |                         |                    |
| W5               |               |                   | R92-0150-05       | JUMPER REST 0 OHM               |                         |                    |
| W23              |               |                   | R92-0150-05       | JUMPER REST 0 OHM               |                         |                    |
| W27              |               |                   | R92-0150-05       | JUMPER REST 0 OHM               |                         |                    |
| W32              |               |                   | R92-0150-05       | JUMPER REST 0 OHM               |                         |                    |
| W100             |               |                   | R92-1061-05       | JUMPER REST 0OHM                |                         |                    |
| RL1              |               |                   | S51-1404-05       | RELAY (G2E,12V)                 |                         |                    |
| D1               |               |                   | 1S1555            | DIODE                           |                         |                    |
| D2 ,3            |               | *                 | US1070            | DIODE                           |                         |                    |
| D4               |               |                   | 1S2588            | DIODE                           |                         |                    |
| D5               |               |                   | BA282             | DIODE                           |                         |                    |
| D6               |               |                   | 1S2588            | DIODE                           |                         |                    |
| D7               |               |                   | BA282             | DIODE                           |                         |                    |
| D8               |               |                   | 1S2588            | DIODE                           |                         |                    |
| D9               |               |                   | BA282             | DIODE                           |                         |                    |
| D10              |               |                   | 1S2588            | DIODE                           |                         |                    |
| D11              |               |                   | BA282             | DIODE                           |                         |                    |
| D12              |               |                   | 1S2588            | DIODE                           |                         |                    |
| D13              |               |                   | BA282             | DIODE                           |                         |                    |
| D14              |               |                   | 1S2588            | DIODE                           |                         |                    |
| D15              |               |                   | BA282             | DIODE                           |                         |                    |
| D16              |               |                   | 1S2588            | DIODE                           |                         |                    |
| D17              |               |                   | BA282             | DIODE                           |                         |                    |
| D18              |               |                   | 1S2588            | DIODE                           |                         |                    |
| D19              |               |                   | BA282             | DIODE                           |                         |                    |
| D20              |               |                   | 1S2588            | DIODE                           |                         |                    |
| D21              |               |                   | BA282             | DIODE                           |                         |                    |
| D22              |               |                   | 1S2588            | DIODE                           |                         |                    |
| D23              |               |                   | BA282             | DIODE                           |                         |                    |
| D24              |               |                   | 1S5133            | DIODE                           |                         |                    |
| D25              |               | *                 | MA858             | DIODE                           |                         |                    |
| D26 -29          |               |                   | BA282             | DIODE                           |                         |                    |

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|--------------------------|---------------|-------------------|-------------------|--------------------------------|------------------------|--------------------|
| D30 -33                  |               |                   | 1S1587            | DIODE                          |                        |                    |
| D34 -37                  |               | *                 | MA858             | DIODE                          |                        |                    |
| D38                      |               | *                 | MA858             | DIODE                          |                        |                    |
| D39                      |               |                   | 1SS133            | DIODE                          |                        |                    |
| D40                      |               |                   | BA282             | DIODE                          |                        |                    |
| D41                      |               | *                 | MA858             | DIODE                          |                        |                    |
| D42 ,43                  |               | *                 | MA858             | DIODE                          |                        |                    |
| D44                      |               |                   | ITT310TE          | VOLTAGE VARIABLE CAP.          |                        |                    |
| D45                      |               | *                 | MA858             | DIODE                          |                        |                    |
| D46                      |               |                   | ITT310TE          | VOLTAGE VARIABLE CAP.          |                        |                    |
| D47                      |               | *                 | MA858             | DIODE                          |                        |                    |
| D48                      |               |                   | ITT310TE          | VOLTAGE VARIABLE CAP.          |                        |                    |
| D49                      |               | *                 | MA858             | DIODE                          |                        |                    |
| D50                      |               |                   | ITT310TE          | VOLTAGE VARIABLE CAP.          |                        |                    |
| D51                      |               | *                 | MA858             | DIODE                          |                        |                    |
| D52 ,53                  |               |                   | 1N60              | DIODE                          |                        |                    |
| D54                      |               |                   | MV13              | VARISTOR                       |                        |                    |
| D56 -58                  |               |                   | 1SS133            | DIODE                          |                        |                    |
| D59                      |               | *                 | UZ3.0B            | ZENER DIODE                    |                        |                    |
| D67                      |               |                   | DAN401            | DIODE                          |                        |                    |
| D68                      |               | *                 | US1090            | DIODE                          |                        |                    |
| D69                      |               | *                 | DSP-301N          | GERGE ABSORBER                 |                        |                    |
| D60 66                   |               |                   | 1SS133            | DIODE                          |                        |                    |
| Q1                       |               |                   | 2SC2459(BL)       | TRANSISTOR                     |                        |                    |
| Q2                       |               |                   | 2SA562(Y)         | TRANSISTOR                     |                        |                    |
| Q3 ,4                    |               |                   | 2SK125-S          | FET                            |                        |                    |
| Q5                       |               |                   | 3SK74(L)          | FET                            |                        |                    |
| Q6 ,7                    |               |                   | 2SK125-S          | FET                            |                        |                    |
| Q8 ,9                    |               |                   | 2SC2668(Y)        | TRANSISTOR                     |                        |                    |
| Q10 ,11                  |               |                   | 3SK122(L)         | FET                            |                        |                    |
| Q12                      |               |                   | 2SC2668(Y)        | TRANSISTOR                     |                        |                    |
| Q13 ,14                  |               |                   | 3SK122(L)         | FET                            |                        |                    |
| Q15                      |               |                   | 2SC2570A          | TRANSISTOR                     |                        |                    |
| Q16                      |               |                   | 2SC2538           | TRANSISTOR                     |                        |                    |
| Q17 -20                  |               |                   | DTC143TS          | DIGITAL TRANSISTOR             |                        |                    |
| Q21 -25                  |               |                   | 2SC2668(Y)        | TRANSISTOR                     |                        |                    |
| Q26                      |               |                   | 2SC1959(Y)        | TRANSISTOR                     |                        |                    |
| Q27                      |               |                   | 2SC2053           | TRANSISTOR                     |                        |                    |
| Q28                      |               |                   | 2SK192A(GR)       | FET                            |                        |                    |
| Q29 -31                  |               |                   | 2SC2668(Y)        | TRANSISTOR                     |                        |                    |
| Q32 ,33                  |               |                   | 2SC2603(E)        | TRANSISTOR                     |                        |                    |
| Q34                      |               |                   | DTC124ES          | DIGITAL TRANSISTOR             |                        |                    |
| Q35                      |               |                   | 2SC2603(E)        | TRANSISTOR                     |                        |                    |
| Q36                      |               |                   | 2SC2459(BL)       | TRANSISTOR                     |                        |                    |
| Q37                      |               |                   | 2SC2603(E)        | TRANSISTOR                     |                        |                    |
| Q38                      |               |                   | UPC4558C          | IC(OP AMP X2)                  |                        |                    |
| Q39                      |               |                   | 2SC2603(E)        | TRANSISTOR                     |                        |                    |
| Q40                      |               |                   | M74LS145P         | IC(DECIMAL DECODER/DRIVER BCD) |                        |                    |
| Q40                      |               |                   | SN74LS145N        | IC(DUAL MONO MULTI)            |                        |                    |
| Q41                      |               |                   | MS4561P           | IC(7CH LED DRIVER)             |                        |                    |
| Q45                      |               |                   | 2SA562(Y)         | TRANSISTOR                     |                        |                    |
| Q46                      |               |                   | DTC124ES          | DIGITAL TRANSISTOR             |                        |                    |
| FINAL UNIT (X45-1470-00) |               |                   |                   |                                |                        |                    |
| C1                       |               |                   | CK45B1H561K       | CERAMIC 560PF K                |                        |                    |

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|------------------|---------------|-------------------|-------------------|-----------------------------|------------------------|--------------------|
| C2               |               |                   | CK45F1H103Z       | CERAMIC 0.010UF Z           |                        |                    |
| C3               |               |                   | CK45F1H223Z       | CERAMIC 0.022UF Z           |                        |                    |
| C4               |               |                   | CK45B1H102K       | CERAMIC 1000PF K            |                        |                    |
| C5 -7            |               |                   | CK45F1H473Z       | CERAMIC 0.047UF Z           |                        |                    |
| C8 ,9            |               |                   | CK45F1H223Z       | CERAMIC 0.022UF Z           |                        |                    |
| C11              |               |                   | CM93D2H681J       | MICA 680PF J                |                        |                    |
| C12 ,13          |               |                   | C91-1004-05       | CERAMIC 0.0068UF J          |                        |                    |
| C14              |               |                   | CM73F2H122J       | CHIP C 1200PF J             |                        |                    |
| C15              |               |                   | CC45SL2H151J      | CERAMIC 150PF J             |                        |                    |
| C17              |               |                   | CK45F1H473Z       | CERAMIC 0.047UF Z           |                        |                    |
| C18              |               |                   | CE04W1C100M       | ELECTR0 10UF 16WV           |                        |                    |
| C19              |               |                   | CK45F1H223Z       | CERAMIC 0.022UF Z           |                        |                    |
| C20              |               |                   | CE04W1E470M       | ELECTR0 47UF 25WV           |                        |                    |
| C21              |               |                   | CK45F1H223Z       | CERAMIC 0.022UF Z           |                        |                    |
| C22              |               |                   | CK45B1H102K       | CERAMIC 1000PF K            |                        |                    |
| C23              |               |                   | CK45F1H473Z       | CERAMIC 0.047UF Z           |                        |                    |
| C24              |               |                   | CE04W1C100M       | ELECTR0 10UF 16WV           |                        |                    |
| C25              |               |                   | CE04W1E101M       | ELECTR0 100UF 25WV          |                        |                    |
| C26 ,27          |               |                   | CK45F1H473Z       | CERAMIC 0.047UF Z           |                        |                    |
| C28 ,29          |               |                   | CK45F1H103Z       | CERAMIC 0.010UF Z           |                        |                    |
| C31              |               |                   | CK45F1H473Z       | CERAMIC 0.047UF Z           |                        |                    |
| C32              |               |                   | CK45F1H223Z       | CERAMIC 0.022UF Z           |                        |                    |
| C33              |               |                   | CE04W1E470M       | ELECTR0 47UF 25WV           |                        |                    |
| 130              | 2M            |                   | E04-0152-05       | RF COAXIAL CABLE RECEPTACLE |                        |                    |
| 132              | 20            |                   | E08-0671-05       | RECTANGULAR RECEPTACLE(6P)  |                        |                    |
| -                |               |                   | E04-0157-05       | RF COAXIAL CABLE RECEPTACLE |                        |                    |
| MC1              |               |                   | E40-0273-05       | PIN CONNECTOR               |                        |                    |
| 136              | 2M            |                   | F09-0410-04       | FAN                         |                        |                    |
| -                |               | *                 | F01-0937-05       | HEAT SINK                   |                        |                    |
| -                |               |                   | F20-0078-05       | INSULATING BOARD            |                        |                    |
| -                |               |                   | F29-0014-05       | INSULATOR                   |                        |                    |
| 142              | 2M            |                   | G02-0549-04       | FLAT SPRING                 |                        |                    |
| 145              | 2N            |                   | J21-4153-14       | FAN MOUNTING HARDWARE       |                        |                    |
| -                |               |                   | L92-0102-05       | TROIDAL CORE (FOR L6,7,11)  |                        |                    |
| -                |               |                   | L92-0106-05       | TROIDAL CORE (FOR T1)       |                        |                    |
| -                |               |                   | L92-0106-05       | TROIDAL CORE (FOR L13)      |                        |                    |
| L1               |               |                   | L40-1511-13       | SMALL FIXED INDUCTOR        |                        |                    |
| L2 ,3            |               |                   | L33-0651-05       | CHOKE COIL                  |                        |                    |
| L4 ,5            |               |                   | L33-0232-05       | CHOKE COIL (1UH)            |                        |                    |
| L6 ,7            |               |                   | L33-0617-05       | CHOKE COIL                  |                        |                    |
| L8 -10           |               |                   | L33-0651-05       | CHOKE COIL                  |                        |                    |
| L11              |               |                   | L33-0617-05       | CHOKE COIL                  |                        |                    |
| L12              |               |                   | L40-1011-13       | SMALL FIXED INDUCTOR        |                        |                    |
| L13              |               | *                 | L39-0424-05       | COIL                        |                        |                    |
| T1               |               |                   | L19-0340-05       | BALUN TRANSFORMER           |                        |                    |
| T2               |               |                   | L19-0338-05       | INPUT TRANSFORMER           |                        |                    |
| T3               |               |                   | L19-0342-05       | DRIVE TRANSFORMER           |                        |                    |
| T4               |               | *                 | L19-0363-05       | FINAL TRANSFORMER           |                        |                    |
| 150              | 1N            |                   | N14-0115-05       | NUT                         |                        |                    |
| 151              | 1N            |                   | N14-0509-05       | NUT                         |                        |                    |
| 152              | 1N            |                   | N15-1040-46       | FLAT WASHER                 |                        |                    |
| A                | 2M, 1N        |                   | N89-3006-46       | BINDING HEAD TAPTITE SCREW  |                        |                    |
| AA               | 10            |                   | N09-0256-05       | SCREW (GND)                 |                        |                    |

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|------------------------|---------------|-------------------|-------------------|------------------------------|------------------------|--------------------|
| CC                     | 2M            |                   | N09-0658-04       | SCREW                        |                        |                    |
| VV                     | 20            |                   | N09-0372-04       | SCREW (PULLEY)               |                        |                    |
| WW                     | 1M            |                   | N09-0682-04       | SCREW                        |                        |                    |
| Y                      | 1N, 2N        |                   | N30-3008-46       | PAN HEAD MACHINE SCREW       |                        |                    |
| Z                      | 20            |                   | N30-4005-46       | PAN HEAD MACHINE SCREW       |                        |                    |
| R3                     |               |                   | RC05GF2H3R9J      | RC 3.9 J 1/2W                |                        |                    |
| R9 ,10                 |               |                   | RC05GF2H181J      | RC 180 J 1/2W                |                        |                    |
| R11 ,14                |               |                   | RS14AB3A5R6J      | FL-PROOF RS 5.6 J 1W         |                        |                    |
| R15 ,16                |               |                   | RC05GF2H150J      | RC 15 J 1/2W                 |                        |                    |
| R17 ,18                |               |                   | RS14AB3A5R6J      | FL-PROOF RS 5.6 J 1W         |                        |                    |
| R33                    |               |                   | RC05GF2H100J      | RC 10 J 1/2W                 |                        |                    |
| VR1 ,2                 |               |                   | R12-1406-05       | TRIMMING PNT. (BASE CURRENT) |                        |                    |
| WB                     |               |                   | R92-0150-05       | JUMPER REST 0 0HM            |                        |                    |
| 155                    | 2N            |                   | T42-0302-05       | DC MOTOR ASSY                |                        |                    |
| D1                     |               |                   | MV-5T             | VARISTOR                     |                        |                    |
| D2 ,3                  |               | *                 | SV03YS            | VARISTOR                     |                        |                    |
| D4                     |               |                   | 1SS133            | DIODE                        |                        |                    |
| D4                     |               |                   | 1S1555            | DIODE                        |                        |                    |
| Q1                     |               |                   | 2SC2075           | TRANSISTOR                   |                        |                    |
| Q2 ,3                  |               |                   | 2SC2509           | TRANSISTOR                   |                        |                    |
| Q4 ,5                  |               | *                 | 2SC2879           | TRANSISTOR                   |                        |                    |
| Q6 ,7                  |               |                   | 2SD1406(Y)        | TRANSISTOR                   |                        |                    |
| Q8                     |               |                   | 2SC1815(Y)        | TRANSISTOR                   |                        |                    |
| Q9                     |               |                   | AN6551            | IC(OP AMP X2)                |                        |                    |
| TH1                    |               |                   | SDT1000           | THERMISTOR                   |                        |                    |
| TH1                    |               | *                 | 5T41L             | THERMISTOR                   |                        |                    |
| PLL UNIT (X50-2050-00) |               |                   |                   |                              |                        |                    |
| C1                     |               |                   | C092M1H223K       | MYLAR 0.022UF K              |                        |                    |
| C2                     |               |                   | C91-0117-05       | CERAMIC 0.01UF K             |                        |                    |
| C3                     |               |                   | C91-0119-05       | CERAMIC 0.047UF K            |                        |                    |
| C4                     |               |                   | C092M1H223K       | MYLAR 0.022UF K              |                        |                    |
| C5                     |               |                   | CK45B1H182K       | CERAMIC 1800PF K             |                        |                    |
| C6                     |               |                   | C91-0119-05       | CERAMIC 0.047UF K            |                        |                    |
| C7                     |               |                   | CE04W1A470M       | ELECTRO 47UF 10WV            |                        |                    |
| C8                     |               |                   | CC45RH1H180J      | CERAMIC 18PF J               |                        |                    |
| C9                     |               |                   | CC45CH1H100D      | CERAMIC 10PF D               |                        |                    |
| C10                    |               |                   | CC45CH1H220J      | CERAMIC 22PF J               |                        |                    |
| C11                    |               |                   | CC45CH1H330J      | CERAMIC 33PF J               |                        |                    |
| C12                    |               |                   | C91-0117-05       | CERAMIC 0.01UF K             |                        |                    |
| C13                    |               |                   | CE04W1A470M       | ELECTRO 47UF 10WV            |                        |                    |
| C14                    |               |                   | CC45CH1H050C      | CERAMIC 5.0PF C              |                        |                    |
| C15                    |               |                   | C91-0769-05       | CERAMIC 0.01UF M             |                        |                    |
| C16                    |               |                   | CC45SL1H050C      | CERAMIC 5.0PF C              |                        |                    |
| C17                    |               |                   | CC45SL1H100D      | CERAMIC 10PF D               |                        |                    |
| C18                    |               |                   | C91-0117-05       | CERAMIC 0.01UF K             |                        |                    |
| C19                    |               |                   | C91-0119-05       | CERAMIC 0.047UF K            |                        |                    |
| C20                    |               |                   | C91-0769-05       | CERAMIC 0.01UF M             |                        |                    |
| C21                    |               |                   | CE04W1C220M       | ELECTRO 22UF 16WV            |                        |                    |
| C22 ,23                |               |                   | C91-1008-05       | CERAMIC 0.022UF K            |                        |                    |
| C24                    |               |                   | C91-0769-05       | CERAMIC 0.01UF M             |                        |                    |
| C25                    |               |                   | C91-1008-05       | CERAMIC 0.022UF K            |                        |                    |
| C26                    |               |                   | CK45B1H391K       | CERAMIC 390PF K              |                        |                    |
| C27                    |               |                   | CK45B1H821K       | CERAMIC 820PF K              |                        |                    |

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|------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| C28              |               |                   | CK45B1H391K       | CERAMIC 390PF K         |                        |                    |
| C29              |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C30              |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C31 ,32          |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C33              |               |                   | CC45SL1H390J      | CERAMIC 39PF J          |                        |                    |
| C34              |               |                   | CC45SL1H820J      | CERAMIC 82PF J          |                        |                    |
| C35              |               |                   | CC45SL1H390J      | CERAMIC 39PF J          |                        |                    |
| C36              |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C37              |               |                   | C91-1008-05       | CERAMIC 0.022UF K       |                        |                    |
| C38 ,39          |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C40 ,41          |               |                   | CQ92M1H223K       | MYLAR 0.022UF K         |                        |                    |
| C42              |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C43              |               |                   | CK45B1H182K       | CERAMIC 1800PF K        |                        |                    |
| C44              |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C45              |               |                   | CE04W1A470M       | ELECTR0 47UF 10WV       |                        |                    |
| C46              |               |                   | CC45UJ1H220J      | CERAMIC 22PF J          |                        |                    |
| C47              |               |                   | CC45CH1H100D      | CERAMIC 10PF D          |                        |                    |
| C48              |               |                   | CC45CH1H120J      | CERAMIC 12PF J          |                        |                    |
| C49              |               |                   | CC45CH1H220J      | CERAMIC 22PF J          |                        |                    |
| C50              |               |                   | CC45SL1H050C      | CERAMIC 5.0PF C         |                        |                    |
| C51              |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C52              |               |                   | CE04W1A470M       | ELECTR0 47UF 10WV       |                        |                    |
| C53              |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C54              |               |                   | CC45SL1H050C      | CERAMIC 5.0PF C         |                        |                    |
| C55              |               |                   | CC45SL1H100D      | CERAMIC 10PF D          |                        |                    |
| C56              |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C57              |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C58              |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C59              |               |                   | C91-1008-05       | CERAMIC 0.022UF K       |                        |                    |
| C60              |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C61              |               |                   | CC45SL1H820J      | CERAMIC 82PF J          |                        |                    |
| C62              |               |                   | CC45SL1H181J      | CERAMIC 180PF J         |                        |                    |
| C63              |               |                   | CC45SL1H820J      | CERAMIC 82PF J          |                        |                    |
| C64              |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C65 -67          |               |                   | C91-1008-05       | CERAMIC 0.022UF K       |                        |                    |
| C68              |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C69              |               |                   | C91-1008-05       | CERAMIC 0.022UF K       |                        |                    |
| C70 ,71          |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C72 -75          |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C76              |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C77 ,78          |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C79 ,80          |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C81              |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C82              |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C83              |               |                   | CQ92M1H223K       | MYLAR 0.022UF K         |                        |                    |
| C84              |               |                   | CQ92M1H333K       | MYLAR 0.033UF K         |                        |                    |
| C85              |               |                   | CK45B1H182K       | CERAMIC 1800PF K        |                        |                    |
| C86              |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C87              |               |                   | CE04W1A470M       | ELECTR0 47UF 10WV       |                        |                    |
| C88              |               |                   | CC45UJ1H330J      | CERAMIC 33PF J          |                        |                    |
| C89              |               |                   | CC45CH1H100D      | CERAMIC 10PF D          |                        |                    |
| C90 ,91          |               |                   | CC45CH1H220J      | CERAMIC 22PF J          |                        |                    |
| C92              |               |                   | CC45CH1H050C      | CERAMIC 0.5PF C         |                        |                    |
| C93              |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C94              |               |                   | CE04W1A470M       | ELECTR0 47UF 10WV       |                        |                    |

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|------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| C95              |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C96 ,97          |               |                   | CC45SL1H100D      | CERAMIC 10PF D          |                        |                    |
| C98              |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C99              |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C100             |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C101,102         |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C104             |               |                   | CC45SL1H680J      | CERAMIC 68PF J          |                        |                    |
| C106             |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C108             |               |                   | CC45CH1H100D      | CERAMIC 10PF D          |                        |                    |
| C109             |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C110             |               |                   | CC45UJ1H180J      | CERAMIC 18PF J          |                        |                    |
| C111             |               |                   | CC45CH1H560J      | CERAMIC 56PF J          |                        |                    |
| C112             |               |                   | CC45CH1H0R5C      | CERAMIC 0.5PF C         |                        |                    |
| C113             |               |                   | CE04W1C220M       | ELECTRO 22UF 16WV       |                        |                    |
| C114             |               |                   | CC45SL1H050C      | CERAMIC 5.0PF C         |                        |                    |
| C115             |               |                   | CC45SL1H100D      | CERAMIC 10PF D          |                        |                    |
| C116             |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C117-121         |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C122             |               |                   | CC45SL1H101J      | CERAMIC 100PF J         |                        |                    |
| C123-128         |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C129             |               |                   | CC45SL1H100D      | CERAMIC 10PF D          |                        |                    |
| C130             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C131             |               |                   | C91-1008-05       | CERAMIC 0.022UF K       |                        |                    |
| C132             |               |                   | CK45B1H102K       | CERAMIC 1000PF K        |                        |                    |
| C133,134         |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C135             |               |                   | CK45B1H102K       | CERAMIC 1000PF K        |                        |                    |
| C136,137         |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C138-141         |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C142             |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C143             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C144             |               |                   | CK45B1H102K       | CERAMIC 1000PF K        |                        |                    |
| C146-148         |               |                   | CC45SL1H101J      | CERAMIC 100PF J         |                        |                    |
| C149             |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C150             |               |                   | CC45RH1H070D      | CERAMIC 7.0PF D         |                        |                    |
| C151             |               |                   | CC45RH1H100D      | CERAMIC 10PF D          |                        |                    |
| C152             |               |                   | CC45RH1H050C      | CERAMIC 5.0PF C         |                        |                    |
| C153             |               |                   | CC45RH1H100D      | CERAMIC 10PF D          |                        |                    |
| C154,155         |               |                   | CC45RH1H080D      | CERAMIC 8.0PF D         |                        |                    |
| C156             |               |                   | CC45SL1H680J      | CERAMIC 68PF J          |                        |                    |
| C157             |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C158             |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C159,160         |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C161-163         |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C165             |               |                   | CS15E1VR33M       | TANTAL 0.33UF 35WV      |                        |                    |
| C166             |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C167             |               |                   | CE04W1A101M       | ELECTRO 100UF 10WV      |                        |                    |
| C168             |               |                   | CK45B1H102K       | CERAMIC 1000PF K        |                        |                    |
| C169             |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C170             |               |                   | CC45CH1H0R5C      | CERAMIC 0.5PF C         |                        |                    |
| C171             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C172             |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C173             |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C175             |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C176             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C177             |               |                   | CD92M1H333K       | MYLAR 0.033UF K         |                        |                    |

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|------------------|---------------|-------------------|-------------------|--------------------------|------------------------|--------------------|
| C178             |               |                   | CS15E1V0R1M       | TANTAL 0.1UF 35WV        |                        |                    |
| C179             |               |                   | CK45B1H182K       | CERAMIC 1800PF K         |                        |                    |
| C180             |               |                   | CE04W1H100M       | ELECTR0 10UF 50WV        |                        |                    |
| C181             |               |                   | C91-0117-05       | CERAMIC 0.01UF K         |                        |                    |
| C182             |               |                   | CS15E1VR47M       | TANTAL 0.47UF 35WV       |                        |                    |
| C183             |               |                   | CC45RH1H070D      | CERAMIC 7.0PF D          |                        |                    |
| C184             |               |                   | C91-0119-05       | CERAMIC 0.047UF K        |                        |                    |
| C185             |               |                   | CE04W1A470M       | ELECTR0 47UF 10WV        |                        |                    |
| C186             |               |                   | C91-0117-05       | CERAMIC 0.01UF K         |                        |                    |
| C187             |               |                   | CC45RH1H060D      | CERAMIC 6.0PF D          |                        |                    |
| C188             |               |                   | CC45CH1H100D      | CERAMIC 10PF D           |                        |                    |
| C189             |               |                   | CC45CH1H220J      | CERAMIC 22PF J           |                        |                    |
| C190             |               |                   | CC45CH1H220J      | CERAMIC 22PF J           |                        |                    |
| C191             |               |                   | CE04W1A470M       | ELECTR0 47UF 10WV        |                        |                    |
| C192             |               |                   | C91-0117-05       | CERAMIC 0.01UF K         |                        |                    |
| C193             |               |                   | CC45CH1H010C      | CERAMIC 1.0PF C          |                        |                    |
| C194             |               |                   | C91-0769-05       | CERAMIC 0.01UF M         |                        |                    |
| C195             |               |                   | CC45SL1H050C      | CERAMIC 5.0PF C          |                        |                    |
| C196             |               |                   | CC45SL1H101J      | CERAMIC 100PF J          |                        |                    |
| C197             |               |                   | C91-0117-05       | CERAMIC 0.01UF K         |                        |                    |
| C198             |               |                   | CK45B1H182K       | CERAMIC 1800PF K         |                        |                    |
| C199             |               | *                 | CC45CH1H090D      | CERAMIC 9.0PF D          |                        |                    |
| C200, 201        |               |                   | CC45SL1H560J      | CERAMIC 56PF J           |                        |                    |
| C202, 203        |               |                   | C91-0117-05       | CERAMIC 0.01UF K         |                        |                    |
| C204             |               |                   | CC45SL1H221J      | CERAMIC 220PF J          |                        |                    |
| C205             |               |                   | CC45CH1H100D      | CERAMIC 10PF D           |                        |                    |
| C206             |               |                   | C91-0119-05       | CERAMIC 0.047UF K        |                        |                    |
| TC1              |               |                   | C05-0035-05       | TRIMMING CAP (50PF)      |                        |                    |
| -                |               |                   | E40-0273-05       | PIN CONNECTOR (MINI, 2P) |                        |                    |
| -                |               |                   | E40-0274-05       | PIN CONNECTOR (MINI, 2P) |                        |                    |
| -                |               |                   | E40-0473-05       | PIN CONNECTOR (MINI, 4P) |                        |                    |
| -                |               |                   | E40-0573-05       | PIN CONNECTOR (MINI, 5P) |                        |                    |
| -                |               |                   | E40-0973-05       | PIN CONNECTOR (MINI, 9P) |                        |                    |
| L1 ,2            |               | *                 | L40-1011-13       | SMALL FIXED INDUCTOR     |                        |                    |
| L3               |               |                   | L40-2211-14       | SMALL FIXED INDUCTOR     |                        |                    |
| L4 ,6            |               | *                 | L40-1011-14       | SMALL FIXED INDUCTOR     |                        |                    |
| L7 ,8            |               | *                 | L40-3311-14       | SMALL FIXED INDUCTOR     |                        |                    |
| L9               |               | *                 | L40-1011-14       | SMALL FIXED INDUCTOR     |                        |                    |
| L10 ,11          |               |                   | L40-3301-14       | SMALL FIXED INDUCTOR     |                        |                    |
| L12 ,13          |               | *                 | L40-1011-13       | SMALL FIXED INDUCTOR     |                        |                    |
| L14              |               |                   | L40-2211-14       | SMALL FIXED INDUCTOR     |                        |                    |
| L15 ,16          |               | *                 | L40-1011-14       | SMALL FIXED INDUCTOR     |                        |                    |
| L17              |               | *                 | L40-1011-13       | SMALL FIXED INDUCTOR     |                        |                    |
| L18 ,19          |               |                   | L40-6801-14       | SMALL FIXED INDUCTOR     |                        |                    |
| L20 ,21          |               | *                 | L40-1011-13       | SMALL FIXED INDUCTOR     |                        |                    |
| L22              |               |                   | L40-2211-14       | SMALL FIXED INDUCTOR     |                        |                    |
| L23 ,24          |               | *                 | L40-1011-14       | SMALL FIXED INDUCTOR     |                        |                    |
| L25 ,26          |               |                   | L40-2201-14       | SMALL FIXED INDUCTOR     |                        |                    |
| L27              |               | *                 | L40-1011-14       | SMALL FIXED INDUCTOR     |                        |                    |
| L28              |               | *                 | L40-1011-13       | SMALL FIXED INDUCTOR     |                        |                    |
| L29              |               | *                 | L40-1001-14       | SMALL FIXED INDUCTOR     |                        |                    |
| L30 ,32          |               |                   | L40-4701-14       | SMALL FIXED INDUCTOR     |                        |                    |
| L33 ,34          |               | *                 | L40-1011-14       | SMALL FIXED INDUCTOR     |                        |                    |
| L35 ,36          |               | *                 | L40-1011-13       | SMALL FIXED INDUCTOR     |                        |                    |

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| L37 ,38          |               |                   | L40-2211-14       | SMALL FIXED INDUCTOR          |                        |                    |
| L39              |               | *                 | L40-1011-13       | SMALL FIXED INDUCTOR          |                        |                    |
| L40              |               | *                 | L40-2201-13       | SMALL FIXED INDUCTOR          |                        |                    |
| L41              |               | *                 | L40-1001-14       | SMALL FIXED INDUCTOR          |                        |                    |
| L42              |               | *                 | L40-1011-13       | SMALL FIXED INDUCTOR          |                        |                    |
| L43              |               |                   | L40-2211-14       | SMALL FIXED INDUCTOR          |                        |                    |
| L44              |               | *                 | L40-1001-14       | SMALL FIXED INDUCTOR          |                        |                    |
| L46              |               | *                 | L40-1011-13       | SMALL FIXED INDUCTOR          |                        |                    |
| L47              |               | *                 | L40-1011-14       | SMALL FIXED INDUCTOR          |                        |                    |
| T1 ,2            |               | *                 | L32-0666-15       | OSCILLATING COIL (VCO, 95MHZ) |                        |                    |
| T3               |               | *                 | L34-2269-05       | COIL (6.6MHZ, BPF)            |                        |                    |
| T4               |               | *                 | L34-2270-05       | COIL (6.6MHZ, BPF)            |                        |                    |
| T5               |               | *                 | L34-2269-05       | COIL (6.6MHZ, BPF)            |                        |                    |
| T6               |               | *                 | L34-2271-05       | COIL (62MHZ, BPF)             |                        |                    |
| T7               |               | *                 | L34-2272-15       | COIL (62MHZ, BPF)             |                        |                    |
| T8               |               | *                 | L34-2292-05       | COIL (62MHZ, BPF)             |                        |                    |
| T9               |               |                   | L32-0639-05       | OSCILLATING COIL (VCO, 55MHZ) |                        |                    |
| T10              |               | *                 | L34-2273-05       | COIL (30MHZ, BPF)             |                        |                    |
| T11              |               | *                 | L34-2274-05       | COIL (30MHZ, BPF)             |                        |                    |
| T12              |               | *                 | L34-2273-05       | COIL (30MHZ, BPF)             |                        |                    |
| T13              |               | *                 | L34-2275-05       | COIL (39MHZ, BPF)             |                        |                    |
| T14              |               | *                 | L34-2276-05       | COIL (39MHZ, BPF)             |                        |                    |
| T15              |               | *                 | L34-2275-05       | COIL (39MHZ, BPF)             |                        |                    |
| T16              |               |                   | L34-0851-05       | COIL (40MHZ, LPF)             |                        |                    |
| T17 ,18          |               |                   | L34-0856-05       | COIL (40MHZ, LPF)             |                        |                    |
| T19              |               |                   | L34-0851-05       | COIL (40MHZ, LPF)             |                        |                    |
| T20              |               |                   | L32-0677-15       | OSCILLATING COIL (VCO, 36MHZ) |                        |                    |
| T45              |               |                   | L34-1124-05       | COIL                          |                        |                    |
| X1               |               | *                 | L77-1299-05       | CRYSTAL RESONATOR             |                        |                    |
| IB1              |               | *                 | R90-0596-05       | MULTI-COMP (100PF X8)         |                        |                    |
| VR1 ,2           |               |                   | R12-4413-05       | TRIMMING PNT. (VCO2, ETC.)    |                        |                    |
| W8               |               |                   | R92-0150-05       | JUMPER REST 0 OHM             |                        |                    |
| W18              |               |                   | R92-0150-05       | JUMPER REST 0 OHM             |                        |                    |
| W20              |               |                   | R92-0150-05       | JUMPER REST 0 OHM             |                        |                    |
| W21              |               |                   | R92-1061-05       | JUMPER REST 0 OHM             |                        |                    |
| W35              |               |                   | R92-0150-05       | JUMPER REST 0 OHM             |                        |                    |
| W45 ,46          |               |                   | R92-0150-05       | JUMPER REST 0 OHM             |                        |                    |
| W49 -51          |               |                   | R92-0150-05       | JUMPER REST 0 OHM             |                        |                    |
| D1 ,2            |               |                   | 1SS133            | DIODE                         |                        |                    |
| D3               |               |                   | 1SV53A            | DIODE                         |                        |                    |
| D4 ,5            |               |                   | 1SS133            | DIODE                         |                        |                    |
| D6               |               |                   | ITT310TE          | VARI CAP                      |                        |                    |
| D7 ,8            |               |                   | 1SS133            | DIODE                         |                        |                    |
| D9               |               |                   | ITT310TE          | VARI CAP                      |                        |                    |
| D10              |               |                   | 1SS133            | DIODE                         |                        |                    |
| D11              |               |                   | MV13              | VARISTOR                      |                        |                    |
| D12              |               |                   | 1SS133            | DIODE                         |                        |                    |
| D13              |               |                   | MV203             | VARISTOR                      |                        |                    |
| D14              |               | *                 | 1SV153            | DIODE                         |                        |                    |
| IC1              |               |                   | MN6147            | IC                            |                        |                    |
| IC1              |               |                   | MN6147C           | IC (FREQ SYNTHESIZER PLL)     |                        |                    |
| IC2              |               |                   | M54459L           | IC (PRE SCALER)               |                        |                    |
| IC3              |               |                   | SN74LS90N         | IC                            |                        |                    |
| IC4              |               |                   | MN6147            | IC                            |                        |                    |

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|---------------------------------------------|---------------|-------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|------------------------|--------------------|
| IC4<br>IC5<br>IC6<br>IC7 ,8<br>IC9          |               | *                 | MN6147C<br>M54460L<br>SN74LS90N<br>SN16913P<br>MN6147                    | IC(FREQ SYNTHESIZER PLL)<br>IC(PRE SCALER)<br>IC<br>IC(DUBLE DALANCED MIXERS)<br>IC                      |                        |                    |
| IC10<br>IC11,12<br>IC13<br>IC14<br>IC15     |               | *                 | M54460L<br>SN16913P<br>SN74S112N<br>SN16913P<br>SN74S10N                 | IC(PRE SCALER)<br>IC(DUBLE DALANCED MIXERS)<br>IC<br>IC(DUBLE DALANCED MIXERS)<br>IC                     |                        |                    |
| IC16<br>IC17<br>IC18<br>Q1 ,2<br>Q3 -5      |               | *                 | SN74S112N<br>MB87006<br>MN6147<br>2SC3113(B)<br>2SC2668(Y)               | IC<br>IC(FREQ SYNTHESIZER PLL)<br>IC<br>TRANSISTOR<br>TRANSISTOR                                         |                        |                    |
| Q6 ,7<br>Q8<br>Q9<br>Q10 ,11<br>Q12 -15     |               |                   | 2SC2458(Y)<br>2SC1959(Y)<br>2SC2458(Y)<br>2SC3113(B)<br>2SC2668(Y)       | TRANSISTOR<br>TRANSISTOR<br>TRANSISTOR<br>TRANSISTOR<br>TRANSISTOR                                       |                        |                    |
| Q16 ,17<br>Q18 -20<br>Q21<br>Q22 -24<br>Q25 |               |                   | 2SC3113(B)<br>2SC2668(Y)<br>2SC2787(L)<br>2SC2668(Y)<br>2SC2458(Y)       | TRANSISTOR<br>TRANSISTOR<br>TRANSISTOR<br>TRANSISTOR<br>VARICAP                                          |                        |                    |
| Q26 -30<br>Q31 -35<br>Q36<br>Q37            |               |                   | 2SC2668(Y)<br>2SC2459(BL)<br>2SK192A(GR)*J<br>2SC2668(Y)                 | TRANSISTOR<br>TRANSISTOR<br>FET<br>TRANSISTOR                                                            |                        |                    |
| <b>FILTER UNIT (X51-1340-00)</b>            |               |                   |                                                                          |                                                                                                          |                        |                    |
| C1 ,2<br>C3 -6<br>C7 ,8<br>C9 ,10<br>C11    |               |                   | CC45CH1H101J<br>CK45B1H222K<br>CK45F1H473Z<br>CK45B1H222K<br>CK45F1H473Z | CERAMIC 100PF J<br>CERAMIC 2200PF K<br>CERAMIC 0.047UF Z<br>CERAMIC 2200PF K<br>CERAMIC 0.047UF Z        |                        |                    |
| C12<br>C13<br>C14<br>C15<br>C16             |               |                   | CK45F1H103Z<br>CE04W1H010M<br>CE04W1HR47M<br>CE04W1H100M<br>CK45F1H103Z  | CERAMIC 0.010UF Z<br>ELECTRO 1.0UF 50WV<br>ELECTRO 0.47UF 50WV<br>ELECTRO 10UF 50WV<br>CERAMIC 0.010UF Z |                        |                    |
| C18<br>C20<br>C21<br>C23<br>C24             |               |                   | C91-0117-05<br>C91-0119-05<br>C91-0117-05<br>CK45F1H103Z<br>CK45F1H223Z  | CERAMIC 0.01UF K<br>CERAMIC 0.047UF K<br>CERAMIC 0.01UF K<br>CERAMIC 0.010UF Z<br>CERAMIC 0.022UF Z      |                        |                    |
| C25<br>C26<br>C27<br>C28<br>C29             |               |                   | CK45F1H103Z<br>CK45F1H473Z<br>CK45F1H103Z<br>CE04W1HR47M<br>C91-0117-05  | CERAMIC 0.010UF Z<br>CERAMIC 0.047UF Z<br>CERAMIC 0.010UF Z<br>ELECTRO 0.47UF 50WV<br>CERAMIC 0.01UF K   |                        |                    |
| C30<br>C31<br>C32 -44<br>C45<br>C46         |               |                   | CE04W1H3R3M<br>C91-0117-05<br>CK45F1H473Z<br>CE04W1H100M<br>CK45F1H103Z  | ELECTRO 3.3UF 50WV<br>CERAMIC 0.01UF K<br>CERAMIC 0.047UF Z<br>ELECTRO 10UF 50WV<br>CERAMIC 0.010UF Z    |                        |                    |

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|------------------|---------------|-------------------|-------------------|-----------------------------|------------------------|--------------------|
| C47              |               |                   | CK45F1H223Z       | CERAMIC 0.022UF Z           |                        |                    |
| C51              |               |                   | CM93D2H152J       | MICA 1500PF J               |                        |                    |
| C52              |               |                   | CM93D2H471J       | MICA 470PF J                |                        |                    |
| C53              |               |                   | CM93D2H152J       | MICA 1500PF J               |                        |                    |
| C54              |               |                   | CM93D2H221J       | MICA 220PF J                |                        |                    |
| C55              |               |                   | CM93D2H821J       | MICA 820PF J                |                        |                    |
| C56              |               | *                 | CC45SL2H431J      | CERAMIC 430PF J             |                        |                    |
| C57              |               | *                 | CC45SL2H241J      | CERAMIC 240PF J             |                        |                    |
| C58 , 59         |               | *                 | CC45SL2H431J      | CERAMIC 430PF J             |                        |                    |
| C60              |               |                   | CC45SL2H151J      | CERAMIC 150PF J             |                        |                    |
| C61              |               | *                 | CC45SL2H331J      | CERAMIC 330PF J             |                        |                    |
| C62              |               |                   | CC45SL2H820J      | CERAMIC 82PF J              |                        |                    |
| C63              |               | *                 | CC45SL2H331J      | CERAMIC 330PF J             |                        |                    |
| C64              |               |                   | CC45SL2H101J      | CERAMIC 100PF J             |                        |                    |
| C65              |               | *                 | CC45SL2H431J      | CERAMIC 430PF J             |                        |                    |
| C66              |               | *                 | CC45SL2H331J      | CERAMIC 330PF J             |                        |                    |
| C67              |               |                   | CC45SL2H151J      | CERAMIC 150PF J             |                        |                    |
| C68              |               |                   | CC45SL2H330J      | CERAMIC 33PF J              |                        |                    |
| C69              |               |                   | CC45SL2H151J      | CERAMIC 150PF J             |                        |                    |
| C70              |               |                   | CC45SL2H121J      | CERAMIC 120PF J             |                        |                    |
| C71              |               |                   | CC45SL2H181J      | CERAMIC 180PF J             |                        |                    |
| C72              |               |                   | CC45SL2H820J      | CERAMIC 82PF J              |                        |                    |
| C73              |               |                   | CC45SL2H680J      | CERAMIC 68PF J              |                        |                    |
| C74              |               |                   | CC45SL2H181J      | CERAMIC 180PF J             |                        |                    |
| C75              |               |                   | CC45SL2H121J      | CERAMIC 120PF J             |                        |                    |
| C76              |               |                   | CC45SL2H101J      | CERAMIC 100PF J             |                        |                    |
| C77              |               |                   | CC45SL2H470J      | CERAMIC 47PF J              |                        |                    |
| C78              |               |                   | CC45SL2H680J      | CERAMIC 68PF J              |                        |                    |
| C79              |               |                   | CC45SL2H330J      | CERAMIC 33PF J              |                        |                    |
| C80              |               |                   | CC45SL2H820J      | CERAMIC 82PF J              |                        |                    |
| C81              |               |                   | CC45SL2H680J      | CERAMIC 68PF J              |                        |                    |
| C82              |               |                   | CC45SL2H820J      | CERAMIC 82PF J              |                        |                    |
| C83              |               |                   | CC45SL2H151J      | CERAMIC 150PF J             |                        |                    |
| C84              |               |                   | C91-0119-05       | CERAMIC 0.047UF K           |                        |                    |
| C86              |               |                   | C91-0119-05       | CERAMIC 0.047UF K           |                        |                    |
| C87              |               |                   | CC45SL2H100D      | CERAMIC 10PF D              |                        |                    |
| -                |               |                   | ED4-0157-05       | RF COAXIAL CABLE RECEPTACLE |                        |                    |
| -                |               |                   | E40-0473-05       | PIN CONNECTOR (MINI,4P)     |                        |                    |
| -                |               |                   | E40-0573-05       | PIN CONNECTOR (MINI,5P)     |                        |                    |
| -                |               |                   | E40-0673-05       | PIN CONNECTOR (MINI,6P)     |                        |                    |
| -                |               |                   | E40-0773-05       | PIN CONNECTOR (MINI,7P)     |                        |                    |
| -                |               |                   | E40-1273-05       | PIN CONNECTOR (MINI,12P)    |                        |                    |
| -                |               |                   | L92-0106-05       | BEAD CORE (FOR L42,43)      |                        |                    |
| -                |               | *                 | L92-0107-05       | BEAD CORE (FOR L30-35)      |                        |                    |
| -                |               | *                 | L92-0108-05       | BEAD CORE (FOR L36,37)      |                        |                    |
| L1 -22           |               |                   | L40-1011-14       | SMALL FIXED INDUCTOR        |                        |                    |
| L30              |               | *                 | L34-3148-05       | COIL                        |                        |                    |
| L31              |               | *                 | L34-3147-05       | COIL                        |                        |                    |
| L32              |               | *                 | L34-3150-05       | COIL                        |                        |                    |
| L33              |               | *                 | L34-3149-05       | COIL                        |                        |                    |
| L34              |               | *                 | L34-3152-05       | COIL                        |                        |                    |
| L35              |               | *                 | L34-3151-05       | COIL                        |                        |                    |
| L36              |               | *                 | L34-3153-05       | COIL                        |                        |                    |

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|----------------------------|---------------|-------------------|-------------------|--------------------------------|------------------------|--------------------|
| L37                        |               | *                 | L34-3154-05       | COIL                           |                        |                    |
| L38                        |               | *                 | L34-3156-05       | COIL                           |                        |                    |
| L40                        |               | *                 | L34-3157-05       | COIL                           |                        |                    |
| L41                        |               | *                 | L34-3158-05       | COIL                           |                        |                    |
| L42                        |               | *                 | L39-0422-05       | COIL                           |                        |                    |
| L43                        |               | *                 | L39-0423-05       | COIL                           |                        |                    |
| R1                         |               |                   | RC05GF2H181J      | RC 180 J 1/2W                  |                        |                    |
| R2 -4                      |               |                   | RC05GF2H101J      | RC 100 J 1/2W                  |                        |                    |
| VR1 ,2                     |               |                   | R12-4414-05       | TRIMMING P0T. (50K) PROTECTION |                        |                    |
| VR3                        |               |                   | R12-3447-05       | TRIMMING P0T. (10K) POWER DOWN |                        |                    |
| VR4 -6                     |               |                   | R12-1431-05       | TRIMMING P0T. (1K) ALC METER   |                        |                    |
| W13                        |               |                   | R92-1061-05       | JUMPER REST 00HM               |                        |                    |
| W14                        |               |                   | R92-0150-05       | JUMPER REST 0 0HM              |                        |                    |
| RL1 -12                    |               |                   | S51-1420-05       | RELAY (DC-1,12V)               |                        |                    |
| S1                         |               |                   | S31-1411-05       | SLIDE SWITCH                   |                        |                    |
| D1                         |               |                   | 1S1587            | DIODE                          |                        |                    |
| D2                         |               |                   | 1S1007            | DIODE                          |                        |                    |
| D3 -5                      |               |                   | 1SS101            | DIODE                          |                        |                    |
| D6                         |               |                   | MTZ9.1JC          | ZENER DIODE                    |                        |                    |
| D6                         |               | *                 | UZ9.1BL           | ZENER DIODE                    |                        |                    |
| D7                         |               |                   | MTZ7.5JA          | ZENER DIODE                    |                        |                    |
| D8                         |               |                   | MTZ9.1JC          | ZENER DIODE                    |                        |                    |
| DB                         |               | *                 | UZ9.1BL           | ZENER DIODE                    |                        |                    |
| D9                         |               |                   | MTZ4.3JC          | ZENER DIODE                    |                        |                    |
| D10                        |               |                   | MTZ3.0JB          | ZENER DIODE                    |                        |                    |
| D12 -23                    |               |                   | 1N4448            | DIODE                          |                        |                    |
| D12 -23                    |               |                   | 1S1555            | DIODE                          |                        |                    |
| D23                        |               |                   | MC931             | DIODE                          |                        |                    |
| D25                        |               |                   | MTZ7.5JA          | ZENER DIODE                    |                        |                    |
| Q1                         |               |                   | DTC114ES          | DIGITAL TRANSISTOR             |                        |                    |
| Q2                         |               |                   | 2SC1815(Y)        | TRANSISTOR                     |                        |                    |
| Q3                         |               |                   | 2SC3113(B)        | TRANSISTOR                     |                        |                    |
| Q4                         |               |                   | DTC114ES          | DIGITAL TRANSISTOR             |                        |                    |
| Q5                         |               |                   | BA718             | IC(OP AMP X2)                  |                        |                    |
| Q6                         |               |                   | DTC114ES          | DIGITAL TRANSISTOR             |                        |                    |
| CONTROL UNIT (X53-1450-11) |               |                   |                   |                                |                        |                    |
| C1 ,2                      |               |                   | CC45CH1H270J      | CERAMIC 27PF J                 |                        |                    |
| C3                         |               |                   | C91-0119-05       | CERAMIC 0.047UF K              |                        |                    |
| C4                         |               |                   | C90-0822-05       | ELECTRO 47UF 16WV              |                        |                    |
| C5                         |               |                   | C91-0769-05       | CERAMIC 0.01UF M               |                        |                    |
| C6                         |               |                   | C91-0119-05       | CERAMIC 0.047UF K              |                        |                    |
| C7                         |               |                   | C90-0822-05       | ELECTRO 47UF 16WV              |                        |                    |
| C8                         |               |                   | C91-0119-05       | CERAMIC 0.047UF K              |                        |                    |
| C9                         |               |                   | C91-0769-05       | CERAMIC 0.01UF M               |                        |                    |
| C10                        |               |                   | C90-0484-05       | ELECTRO 0.47UF 50WV            |                        |                    |
| C11                        |               |                   | C90-0822-05       | ELECTRO 47UF 16WV              |                        |                    |
| C12                        |               |                   | C91-0757-05       | CERAMIC 0.001UF K              |                        |                    |
| C13                        |               |                   | C91-0769-05       | CERAMIC 0.01UF M               |                        |                    |
| C14                        |               |                   | C90-0822-05       | ELECTRO 47UF 16WV              |                        |                    |
| C15 ,16                    |               |                   | CC45SL1H101J      | CERAMIC 100PF J                |                        |                    |
| C17 ,18                    |               |                   | C91-0757-05       | CERAMIC 0.001UF K              |                        |                    |
| C19                        |               |                   | C092M1H472K       | MYLAR 4700PF K                 |                        |                    |
| C20 ,21                    |               |                   | C91-0769-05       | CERAMIC 0.01UF M               |                        |                    |

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|------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| C22              |               |                   | C90-0822-05       | ELECTRØ 47UF 16WV       |                        |                    |
| C23 -38          |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C39 -41          |               |                   | C91-0753-05       | CERAMIC 470PF K         |                        |                    |
| C45 -48          |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C50              |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C51              |               | *                 | C90-2020-05       | ELECTRØ 15UF 25WV       |                        |                    |
| C52              |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C53 ,54          |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C55              |               |                   | C90-0822-05       | ELECTRØ 47UF 16WV       |                        |                    |
| C56              |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C57              |               |                   | C90-0822-05       | ELECTRØ 47UF 16WV       |                        |                    |
| C58              |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C59              |               |                   | C90-0822-05       | ELECTRØ 47UF 16WV       |                        |                    |
| C60              |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C61              |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C62              |               |                   | C90-0822-05       | ELECTRØ 47UF 16WV       |                        |                    |
| C63 ,64          |               |                   | C91-0757-05       | CERAMIC 0.001UF K       |                        |                    |
| C65 -70          |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C100-114         |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| -                |               | *                 | E02-0114-05       | TRANSISTØR SOCKET (16P) |                        |                    |
| -                |               |                   | E02-2001-05       | TRANSISTØR SOCKET (28P) |                        |                    |
| -                |               |                   | E40-3237-05       | PIN CONNECTØR (MINI,2P) |                        |                    |
| -                |               |                   | E40-3238-05       | PIN CONNECTØR (MINI,3P) |                        |                    |
| -                |               |                   | E40-3239-05       | PIN CONNECTØR (MINI,4P) |                        |                    |
| -                |               |                   | E40-3240-05       | PIN CONNECTØR (MINI,5P) |                        |                    |
| -                |               |                   | E40-3241-05       | PIN CONNECTØR (MINI,6P) |                        |                    |
| -                |               |                   | E40-3242-05       | PIN CONNECTØR (MINI,7P) |                        |                    |
| -                |               |                   | E40-3243-05       | PIN CONNECTØR (MINI,8P) |                        |                    |
| -                |               |                   | E40-5066-05       | PIN CONNECTØR (MINI,9P) |                        |                    |
| L1               |               |                   | L40-1011-13       | SMALL FIXED INDUCTØR    |                        |                    |
| L3 ,4            |               |                   | L40-1011-14       | SMALL FIXED INDUCTØR    |                        |                    |
| L5               |               |                   | L40-1011-03       | SMALL FIXED INDUCTØR    |                        |                    |
| L6 -19           |               |                   | L40-1011-14       | SMALL FIXED INDUCTØR    |                        |                    |
| L23              |               |                   | L40-1011-14       | SMALL FIXED INDUCTØR    |                        |                    |
| L50 ,51          |               |                   | L40-1011-14       | SMALL FIXED INDUCTØR    |                        |                    |
| L52              |               |                   | L40-1011-13       | SMALL FIXED INDUCTØR    |                        |                    |
| L53 -55          |               |                   | L40-1011-03       | SMALL FIXED INDUCTØR    |                        |                    |
| L58 ,59          |               |                   | L40-4701-14       | SMALL FIXED INDUCTØR    |                        |                    |
| X1               |               | *                 | L78-0019-05       | RESØNATOR (1.99MHZ)     |                        |                    |
| X50              |               |                   | L78-0015-05       | RESØNATOR (2.45MHZ)     |                        |                    |
| RB1              |               |                   | R90-0510-05       | MULTI-CØMP (4.7KX8)     |                        |                    |
| RB50             |               |                   | R90-0510-05       | MULTI-CØMP (4.7KX8)     |                        |                    |
| RB51             |               |                   | R90-0521-05       | MULTI-CØMP (47KX7)      |                        |                    |
| RB52             |               |                   | R90-0597-05       | MULTI-CØMP (1KX4)       |                        |                    |
| W1 -3            |               |                   | R92-1061-05       | JUMPER REST 0ØHM        |                        |                    |
| W50              |               |                   | R92-1061-05       | JUMPER REST 0ØHM        |                        |                    |
| S50              |               | *                 | S31-0402-05       | SLIDE SWITCH            |                        |                    |
| D1 ,2            |               |                   | 1S5133            | DIØDE                   |                        |                    |
| D5 -9            |               |                   | 1S5133            | DIØDE                   |                        |                    |
| D51 -71          |               |                   | 1S5133            | DIØDE                   |                        |                    |
| D73              |               |                   | 1S5133            | DIØDE                   |                        |                    |
| D75              |               |                   | 1S5133            | DIØDE                   |                        |                    |

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|---------------------------------------------------------|---------------|-------------------|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|--------------------|
| D81<br>D82 -84<br>IC1<br>IC2<br>IC2                     |               |                   | 1SS101<br>1SS133<br>UPD7800G<br>TMP8255AP-5<br>UPD8255AC-5                      | DIODE<br>DIODE<br>IC(MICROPROCESSOR)<br>IC(PROGRAMMABLE INTERFACE)<br>IC(PROGRAMMABLE INTERFACE)                                                           |                         |                    |
| IC3<br>IC4<br>IC5<br>IC6<br>IC7                         |               |                   | PST520D<br>* TC4069UBP<br>TC4011BP<br>* TC4030BP<br>TC4011BP                    | IC(LOW POWER RESET)<br>IC(INVERTER X6)<br>IC(NAND X4)<br>IC(EXCLUSIVE OR X4)<br>IC(NAND X4)                                                                |                         |                    |
| IC20<br>IC51<br>IC52<br>IC53<br>IC53                    |               |                   | MB8418-20LP-GRA<br>SN74LS138N<br>* MBM27128-25JA1<br>TMP8255AP-5<br>UPD8255AC-5 | IC(16K RAM)<br>IC<br>IC(PROGRAMMABLE INTERFACE)<br>IC(PROGRAMMABLE INTERFACE)<br>IC(PROGRAMMABLE INTERFACE)                                                |                         |                    |
| IC56<br>Q1 -7<br>Q8 -13<br>Q14<br>Q18 -24<br>Q25<br>Q50 |               |                   | * SN7404N<br>DTC144WS<br>DTA114ES<br>DTC144WS<br>DTA114ES<br>DTC144WS           | IC(6-CIRCUIT INVERTER)<br>DIGITAL TRANSISTOR<br>DIGITAL TRANSISTOR<br>DIGITAL TRANSISTOR<br>DIGITAL TRANSISTOR<br>DIGITAL TRANSISTOR<br>DIGITAL TRANSISTOR |                         |                    |
| <b>DISPLAY UNIT (X54-1870-00)</b>                       |               |                   |                                                                                 |                                                                                                                                                            |                         |                    |
| C1<br>C2<br>C3<br>C4<br>C5 -7                           |               |                   | C90-0871-05<br>C91-0119-05<br>* C90-0504-05<br>CQ92M1H223K<br>* C90-0504-05     | ELECTRO 220UF 16WV<br>CERAMIC 0.047UF K<br>ELECTRO 10UF 35WV<br>MYLAR 0.022UF K<br>ELECTRO 10UF 35WV                                                       |                         |                    |
| C10<br>C11<br>C12 -14<br>C15<br>C16                     |               |                   | C91-0769-05<br>C90-0822-05<br>C91-0769-05<br>C90-0822-05<br>C91-0769-05         | CERAMIC 0.01UF M<br>ELECTRO 47UF 16WV<br>CERAMIC 0.01UF M<br>ELECTRO 47UF 16WV<br>CERAMIC 0.01UF M                                                         |                         |                    |
| C17<br>C50 -52<br>C53<br>C54 -56<br>C57                 |               |                   | C91-0119-05<br>* CK45F1H103Z<br>CK45E2H222P<br>CK45B1H102K<br>CK45F1H103Z       | CERAMIC 0.047UF K<br>CERAMIC 0.010UF Z<br>CERAMIC 2200PF P<br>CERAMIC 1000PF K<br>CERAMIC 0.010UF Z                                                        |                         |                    |
| -<br>-<br>-<br>-<br>-                                   |               |                   | E40-3237-05<br>E40-3238-05<br>E40-3239-05<br>E40-3240-05<br>E40-3241-05         | PIN CONNECTOR (MINI,2P)<br>PIN CONNECTOR (MINI,3P)<br>PIN CONNECTOR (MINI,4P)<br>PIN CONNECTOR (MINI,5P)<br>PIN CONNECTOR (MINI,6P)                        |                         |                    |
| -                                                       |               |                   | E40-3242-05                                                                     | PIN CONNECTOR (MINI,7P)                                                                                                                                    |                         |                    |
| L1 -4<br>L50<br>T1                                      |               |                   | L40-1011-13<br>L40-1011-14<br>L19-0305-05                                       | SMALL FIXED INDUCTOR<br>SMALL FIXED INDUCTOR<br>OSC TRANSFORMER                                                                                            |                         |                    |
| RB1<br>RB2<br>RB3<br>RB4                                |               |                   | R90-0511-05<br>R90-0193-05<br>R90-0520-05<br>R90-0515-05                        | MULTI-COMP 47KX8<br>MULTI-COMP 47KX9 J 1/6W<br>MULTI-COMP 47KX5<br>MULTI-COMP 10KX4                                                                        |                         |                    |
| S50<br>S51 -52                                          |               |                   | S40-2441-15<br>S40-2440-15                                                      | PUSH SWITCH<br>PUSH SWITCH                                                                                                                                 |                         |                    |

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|-----------------------------------------------|---------------|-------------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-------------------------|--------------------|
| S53<br>S54 -56<br>S57<br>S58 -60              |               |                   | S31-2405-05<br>S40-2440-15<br>S40-2441-15<br>S40-2440-15                 | SLIDE SWITCH<br>PUSH SWITCH<br>PUSH SWITCH<br>PUSH SWITCH                                                                      |                         |                    |
| D1 -4<br>D5 ,6<br>D50 ,51<br>D52<br>IC1       |               | *                 | 1S1555<br>MTZ6.2JA<br>1SS133<br>1SS101<br>UPD6300C                       | DIODE<br>ZENER DIODE<br>DIODE<br>DIODE<br>IC(FL LATCH DRIVER)                                                                  |                         |                    |
| IC2<br>IC3<br>PL1<br>Q1 ,2<br>Q3              |               | *                 | MB4052<br>TC4013BP<br>FIP13BM7<br>DTA114ES<br>DTC144WS                   | IC(4CH 8BIT A/D CONVERTER(ADC)<br>IC(D FLIP-FLIP X2)<br>FLUORESCENT INDICATOR TUBE<br>DIGITAL TRANSISTOR<br>DIGITAL TRANSISTOR |                         |                    |
| Q4 ,5<br>Q50                                  |               |                   | 2SC1959(Y)<br>DTC143TS                                                   | TRANSISTOR<br>DIGITAL TRANSISTOR                                                                                               |                         |                    |
| AT UNIT (X57-1150-00)                         |               |                   |                                                                          |                                                                                                                                |                         |                    |
| C1 ,2<br>C3 ,4<br>C5<br>C6<br>C7              |               |                   | C91-0117-05<br>CK45B1H102K<br>C91-0119-05<br>CK45B1H102K<br>C91-0119-05  | CERAMIC 0.01UF K<br>CERAMIC 1000PF K<br>CERAMIC 0.047UF K<br>CERAMIC 1000PF K<br>CERAMIC 0.047UF K                             |                         |                    |
| C8<br>C9<br>C10<br>C11<br>C12                 |               |                   | CK45B1H102K<br>C91-0119-05<br>CE04W1H100M<br>CE04W1C470M<br>C91-0119-05  | CERAMIC 1000PF K<br>CERAMIC 0.047UF K<br>ELECTRO 10UF 50WV<br>ELECTRO 47UF 16WV<br>CERAMIC 0.047UF K                           |                         |                    |
| C13 -15<br>C16<br>C17 ,18<br>C19<br>C20       |               |                   | C91-0117-05<br>CK45F1H473Z<br>C91-0117-05<br>CE04W1E101M<br>C91-0117-05  | CERAMIC 0.01UF K<br>CERAMIC 0.047UF Z<br>CERAMIC 0.01UF K<br>ELECTRO 100UF 25WV<br>CERAMIC 0.01UF K                            |                         |                    |
| C21<br>C22<br>C23<br>C24<br>C25               |               |                   | CK45F1H473Z<br>C91-0117-05<br>C91-0119-05<br>C092M1H333K<br>CK45B1H102K  | CERAMIC 0.047UF Z<br>CERAMIC 0.01UF K<br>CERAMIC 0.047UF K<br>MYLAR 0.033UF K<br>CERAMIC 1000PF K                              |                         |                    |
| C26<br>C27<br>C28 ,29<br>C30<br>C31           |               |                   | CE04W1H010M<br>CE04W1H100M<br>CK45F1H103Z<br>C91-0117-05<br>CC45SL2H560J | ELECTRO 1.0UF 50WV<br>ELECTRO 10UF 50WV<br>CERAMIC 0.010UF Z<br>CERAMIC 0.01UF K<br>CERAMIC 56PF J                             |                         |                    |
| C100-105<br>C106-111<br>C112<br>TC1<br>VC1 ,2 |               | *                 | CK45F1H473Z<br>CK45F1H103Z<br>CK45F1H473Z<br>C05-0324-05<br>C02-0023-05  | CERAMIC 0.047UF Z<br>CERAMIC 0.010UF Z<br>CERAMIC 0.047UF Z<br>TRIMMING CAP 60PF<br>VARIABLE CAPACITOR                         |                         |                    |
| 163                                           | 2P            | *                 | D40-0629-05                                                              | GEAR MECHANISM ASSY                                                                                                            |                         |                    |
| -                                             |               |                   | E04-0157-05                                                              | RF COAXIAL CABLE RECEPTACLE                                                                                                    |                         |                    |
| -                                             |               |                   | E40-0273-05                                                              | PIN CONNECTOR (MINI,2P)                                                                                                        |                         |                    |
| -                                             |               |                   | E40-0473-05                                                              | PIN CONNECTOR (MINI,4P)                                                                                                        |                         |                    |
| -                                             |               |                   | E40-0673-05                                                              | PIN CONNECTOR (MINI,6P)                                                                                                        |                         |                    |
| -                                             |               |                   | E40-0873-05                                                              | PIN CONNECTOR (MINI,8P)                                                                                                        |                         |                    |

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|------------------|---------------|-------------------|-------------------|----------------------------------|------------------------|--------------------|
| -                |               |                   | L92-0103-05       | TRIADAL CORE (FOR L1,2)          |                        |                    |
| -                |               | *                 | L92-0119-05       | TRIADAL CORE (FOR T100,101)      |                        |                    |
| L1               |               |                   | L39-0416-05       | COIL                             |                        |                    |
| L2               |               |                   | L39-0415-05       | COIL                             |                        |                    |
| L3               |               |                   | L40-1011-13       | SMALL FIXED INDUCTOR             |                        |                    |
| L4               |               |                   | L40-1011-14       | SMALL FIXED INDUCTOR             |                        |                    |
| L5 -11           |               |                   | L40-1011-13       | SMALL FIXED INDUCTOR             |                        |                    |
| L12              |               |                   | L40-1011-14       | SMALL FIXED INDUCTOR             |                        |                    |
| L13 ,14          |               |                   | L40-1011-13       | SMALL FIXED INDUCTOR             |                        |                    |
| L100             |               |                   | L40-1011-13       | SMALL FIXED INDUCTOR             |                        |                    |
| T100             |               | *                 | L34-3144-15       | COIL                             |                        |                    |
| T101             |               | *                 | L34-3145-15       | COIL                             |                        |                    |
| T102             |               | *                 | L34-3146-15       | COIL                             |                        |                    |
| R                | 1P,1Q         |                   | N88-3006-46       | FLAT HEAD TAPTITE SCREW          |                        |                    |
| M                | 1Q,2R         |                   | N87-2606-46       | BRAZIER HEAD TAPTITE SCREW       |                        |                    |
| N                | 2P,1R         |                   | N87-3006-46       | BRAZIER HEAD TAPTITE SCREW       |                        |                    |
| R1               |               | *                 | RC05GF2H510J      | RC 51 J 1/2W                     |                        |                    |
| VR1 ,2           |               |                   | R12-3425-05       | TRIMMING POT. (10K) AUTO ANT TUN |                        |                    |
| W11              |               |                   | R92-0150-05       | JUMPER REST 0 OHM                |                        |                    |
| W16 ,17          |               |                   | R92-1061-05       | JUMPER REST 0OHM                 |                        |                    |
| W19              |               |                   | R92-0150-05       | JUMPER REST 0 OHM                |                        |                    |
| RL1              |               | *                 | S51-2417-05       | RELAY (DC-2,12V)                 |                        |                    |
| RL 100-105       |               |                   | S51-1420-05       | RELAY (DC-1,12V)                 |                        |                    |
| M1 ,2            |               |                   | T42-0303-05       | DC MOTOR ASSY                    |                        |                    |
| D1 -4            |               |                   | 1S599             | DIODE                            |                        |                    |
| D5 ,6            |               | *                 | UZ6.2BL           | ZENER DIODE                      |                        |                    |
| D7               |               |                   | 1S5133            | DIODE                            |                        |                    |
| D8               |               |                   | 1N4448            | DIODE                            |                        |                    |
| D8               |               |                   | 1S1555            | DIODE                            |                        |                    |
| D9               |               |                   | 1S5133            | DIODE                            |                        |                    |
| D10 ,11          |               |                   | 1N60              | DIODE                            |                        |                    |
| D12              |               |                   | 1S5133            | DIODE                            |                        |                    |
| D100-105         |               |                   | 1N4448            | DIODE                            |                        |                    |
| D100-105         |               |                   | 1S1555            | DIODE                            |                        |                    |
| IC1              |               |                   | NJM2903D          | IC(DUAL COMPARATOR)              |                        |                    |
| IC2              |               |                   | HD10116           | IC(TRIPLE LINE RECEIVERS)        |                        |                    |
| IC2              |               |                   | MC10116L          | IC                               |                        |                    |
| IC3              |               |                   | HD10131           | IC(D FLIP-FLOP)                  |                        |                    |
| IC3              |               |                   | MC10131L          | IC                               |                        |                    |
| IC4              |               |                   | HD10125           | IC(QUAD ECL-TTL TRANSLATORS)     |                        |                    |
| IC4              |               |                   | MC10125L          | IC                               |                        |                    |
| IC5 ,6           |               |                   | BA6109U2          | IC(MOTOR DRIVER)                 |                        |                    |
| IC7              |               |                   | NE555P            | IC                               |                        |                    |
| IC8              |               |                   | MB3614            | IC(QUAD OPERATIONAL AMPLIFIER)   |                        |                    |
| Q1               |               | *                 | DTC114ES          | DIGITAL TRANSISTOR               |                        |                    |
| Q2               |               |                   | 2SA950(Y)         | TRANSISTOR                       |                        |                    |
| Q3               |               | *                 | DTC114ES          | DIGITAL TRANSISTOR               |                        |                    |
| Q4               |               |                   | 2SA950(Y)         | TRANSISTOR                       |                        |                    |
| Q5               |               |                   | 2SC2458(Y)        | TRANSISTOR                       |                        |                    |
| Q6               |               | *                 | DTC114ES          | DIGITAL TRANSISTOR               |                        |                    |
| Q7               |               |                   | DTC124ES          | DIGITAL TRANSISTOR               |                        |                    |
| Q100-105         |               |                   | 2SC2668(Y)        | TRANSISTOR                       |                        |                    |

## PARTS LIST

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|---------------------------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| <b>SIDE TONE UNIT (X59-1060-00)</b>   |               |                   |                   |                         |                        |                    |
| C1                                    |               |                   | CK73FB1E223K      | CHIP C 0.022UF K        |                        |                    |
| C2 -5                                 |               | *                 | CK73FB1H123K      | CHIP C 0.012UF K        |                        |                    |
| C6 -8                                 |               |                   | CK73FB1E223K      | CHIP C 0.022UF K        |                        |                    |
| -                                     |               |                   | E23-0471-05       | TERMINAL                |                        |                    |
| R1 +2                                 |               |                   | RK73FB2A823J      | CHIP R 82K J 1/10W      |                        |                    |
| R3                                    |               |                   | RK73FB2A223J      | CHIP R 22K J 1/10W      |                        |                    |
| R4                                    |               |                   | RK73FB2A472J      | CHIP R 4.7K J 1/10W     |                        |                    |
| R5                                    |               |                   | RK73FB2A102J      | CHIP R 1.0K J 1/10W     |                        |                    |
| R6                                    |               |                   | RK73FB2A103J      | CHIP R 10K J 1/10W      |                        |                    |
| R7 +8                                 |               |                   | RK73FB2A333J      | CHIP R 33K J 1/10W      |                        |                    |
| R9                                    |               |                   | RK73FB2A103J      | CHIP R 10K J 1/10W      |                        |                    |
| R10                                   |               |                   | RK73FB2A333J      | CHIP R 33K J 1/10W      |                        |                    |
| R11                                   |               |                   | RK73FB2A183J      | CHIP R 18K J 1/10W      |                        |                    |
| W1 -6                                 |               |                   | R92-0670-05       | CHIP R 0 0HM            |                        |                    |
| D1                                    |               |                   | DAN202(K)         | CHIP DIODE              |                        |                    |
| D2                                    |               |                   | DAP202(K)         | CHIP DIODE              |                        |                    |
| D3                                    |               |                   | DAN202(K)         | CHIP DIODE              |                        |                    |
| Q1                                    |               |                   | 2SC2712(Y)        | CHIP TRANSISTOR         |                        |                    |
| <b>SELECTIVITY UNIT (X59-1070-00)</b> |               |                   |                   |                         |                        |                    |
| -                                     |               |                   | E23-0471-05       | TERMINAL                |                        |                    |
| R1                                    |               |                   | RK73FB2A473J      | CHIP R 47K J 1/10W      |                        |                    |
| R2                                    |               |                   | RK73FB2A103J      | CHIP R 10K J 1/10W      |                        |                    |
| R3                                    |               |                   | RK73FB2A473J      | CHIP R 47K J 1/10W      |                        |                    |
| R4                                    |               |                   | RK73FB2A103J      | CHIP R 10K J 1/10W      |                        |                    |
| R5                                    |               |                   | RK73FB2A473J      | CHIP R 47K J 1/10W      |                        |                    |
| R6                                    |               |                   | RK73FB2A103J      | CHIP R 10K J 1/10W      |                        |                    |
| R7                                    |               |                   | RK73FB2A473J      | CHIP R 47K J 1/10W      |                        |                    |
| R8                                    |               |                   | RK73FB2A103J      | CHIP R 10K J 1/10W      |                        |                    |
| W1 -3                                 |               |                   | R92-0670-05       | CHIP R 0 0HM            |                        |                    |
| D1 +2                                 |               |                   | DAN202(K)         | CHIP DIODE              |                        |                    |
| D3                                    |               |                   | DAP202(K)         | CHIP DIODE              |                        |                    |
| D4 +5                                 |               |                   | DAN202(K)         | CHIP DIODE              |                        |                    |
| D6                                    |               |                   | DAP202(K)         | CHIP DIODE              |                        |                    |
| Q1 -4                                 |               |                   | 2SA1162(Y)        | CHIP TRANSISTOR         |                        |                    |
| <b>VOX. UNIT (X59-1080-00)</b>        |               |                   |                   |                         |                        |                    |
| C1                                    |               |                   | CK73FB1H102K      | CHIP C 1000PF K         |                        |                    |
| C2                                    |               |                   | CK73FB1E223K      | CHIP C 0.022UF K        |                        |                    |
| -                                     |               |                   | E23-0471-05       | TERMINAL                |                        |                    |
| R1                                    |               |                   | RK73FB2A104J      | CHIP R 100K J 1/10W     |                        |                    |
| R2 -5                                 |               |                   | RK73FB2A103J      | CHIP R 10K J 1/10W      |                        |                    |
| R6 +7                                 |               |                   | RK73FB2A105J      | CHIP R 1.0M J 1/10W     |                        |                    |
| R8                                    |               |                   | RK73FB2A474J      | CHIP R 470K J 1/10W     |                        |                    |
| R9                                    |               |                   | RK73FB2A105J      | CHIP R 1.0M J 1/10W     |                        |                    |
| R10                                   |               |                   | RK73FB2A103J      | CHIP R 10K J 1/10W      |                        |                    |
| W1 -3                                 |               |                   | R92-0670-05       | CHIP R 0 0HM            |                        |                    |
| D1 +2                                 |               |                   | DAP202(K)         | CHIP DIODE              |                        |                    |
| IC1                                   |               |                   | NJM2904M          | IC(OP AMP X2)           |                        |                    |
| IC2                                   |               |                   | TC4001BF          | IC(NOR X6)              |                        |                    |
| Q1                                    |               | *                 | 2SC2712(Y)        | CHIP TRANSISTOR         |                        |                    |

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|-----------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| IF UNIT (X60-1300-00) |               |                   |                   |                         |                        |                    |
| C1                    |               |                   | C91-0769-05       | CERAMIC                 | 0.01UF                 | M                  |
| C2                    |               |                   | CC45SL1H150J      | CERAMIC                 | 15PF                   | J                  |
| C3 -6                 |               |                   | C91-0769-05       | CERAMIC                 | 0.01UF                 | M                  |
| C7                    |               |                   | CC45SL1H150J      | CERAMIC                 | 15PF                   | J                  |
| C8 -10                |               |                   | C91-0769-05       | CERAMIC                 | 0.01UF                 | M                  |
| C11                   |               |                   | C91-0117-05       | CERAMIC                 | 0.01UF                 | K                  |
| C12 ,13               |               |                   | CK45F1H103Z       | CERAMIC                 | 0.010UF                | Z                  |
| C14 -16               |               |                   | C91-0119-05       | CERAMIC                 | 0.047UF                | K                  |
| C17                   |               |                   | CK45F1H223Z       | CERAMIC                 | 0.022UF                | Z                  |
| C18 -22               |               |                   | C91-0119-05       | CERAMIC                 | 0.047UF                | K                  |
| C24                   |               |                   | C91-1008-05       | CERAMIC                 | 0.022UF                | K                  |
| C25 -30               |               |                   | C91-0119-05       | CERAMIC                 | 0.047UF                | K                  |
| C31                   |               |                   | CC45SL1H050C      | CERAMIC                 | 5.0PF                  | C                  |
| C32 -34               |               |                   | C91-0119-05       | CERAMIC                 | 0.047UF                | K                  |
| C35                   |               |                   | CK45F1H223Z       | CERAMIC                 | 0.022UF                | Z                  |
| C36 ,37               |               |                   | C91-0119-05       | CERAMIC                 | 0.047UF                | K                  |
| C38                   |               |                   | C91-0769-05       | CERAMIC                 | 0.01UF                 | M                  |
| C39                   |               |                   | CE04W1H0R1M       | ELECTRØ                 | 0.1UF                  | 50WV               |
| C39 ,40               |               |                   | C91-0119-05       | CERAMIC                 | 0.047UF                | K                  |
| C41                   |               |                   | C91-1008-05       | CERAMIC                 | 0.022UF                | K                  |
| C43                   |               |                   | C91-0119-05       | CERAMIC                 | 0.047UF                | K                  |
| C44                   |               |                   | CC45SL1H101J      | CERAMIC                 | 100PF                  | J                  |
| C45                   |               |                   | CK45B1H102K       | CERAMIC                 | 1000PF                 | K                  |
| C46 ,47               |               |                   | C91-0119-05       | CERAMIC                 | 0.047UF                | K                  |
| C48                   |               |                   | CC45UJ1H470J      | CERAMIC                 | 47PF                   | J                  |
| C49                   |               |                   | CC45UJ1H680J      | CERAMIC                 | 68PF                   | J                  |
| C50                   |               |                   | CK45F1H103Z       | CERAMIC                 | 0.010UF                | Z                  |
| C51                   |               |                   | CQ92M1H333K       | MYLAR                   | 0.033UF                | K                  |
| C52                   |               |                   | CE04W1H4R7M       | ELECTRØ                 | 4.7UF                  | 50WV               |
| C53                   |               |                   | CE04W1HR47M       | ELECTRØ                 | 0.47UF                 | 50WV               |
| C54                   |               |                   | CK45B1H102K       | CERAMIC                 | 1000PF                 | K                  |
| C55                   |               |                   | CK45B1H221K       | CERAMIC                 | 220PF                  | K                  |
| C56                   |               |                   | CQ92M1H103K       | MYLAR                   | 0.010UF                | K                  |
| C57                   |               |                   | CE04W1H100M       | ELECTRØ                 | 10UF                   | 50WV               |
| C58                   |               |                   | CE04W1H010M       | ELECTRØ                 | 1.0UF                  | 50WV               |
| C59                   |               |                   | CE04W1H4R7M       | ELECTRØ                 | 4.7UF                  | 50WV               |
| C60                   |               |                   | CQ92M1H473K       | MYLAR                   | 0.047UF                | K                  |
| C61                   |               |                   | CQ92M1H103K       | MYLAR                   | 0.010UF                | K                  |
| C62                   |               |                   | CQ92M1H333K       | MYLAR                   | 0.033UF                | K                  |
| C63                   |               |                   | CE04W1A101M       | ELECTRØ                 | 100UF                  | 10WV               |
| C64                   |               |                   | CE04W1H100M       | ELECTRØ                 | 10UF                   | 50WV               |
| C65                   |               |                   | CQ92M1H392K       | MYLAR                   | 3900PF                 | K                  |
| C66 ,67               |               |                   | CE04W1HR47M       | ELECTRØ                 | 0.47UF                 | 50WV               |
| C68                   |               |                   | CE04W1HR22M       | ELECTRØ                 | 0.22UF                 | 50WV               |
| C70                   |               |                   | CE04W1A470M       | ELECTRØ                 | 47UF                   | 10WV               |
| C71                   |               |                   | CE04W1HR22M       | ELECTRØ                 | 0.22UF                 | 50WV               |
| C72                   |               |                   | CQ92M1H822K       | MYLAR                   | 8200PF                 | K                  |
| C73 ,74               |               |                   | CE04W1H4R7M       | ELECTRØ                 | 4.7UF                  | 50WV               |
| C76 ,77               |               |                   | C91-0119-05       | CERAMIC                 | 0.047UF                | K                  |
| C78                   |               |                   | CE04W1H2R2M       | ELECTRØ                 | 2.2UF                  | 50WV               |
| C79                   |               |                   | CE04W1H010M       | ELECTRØ                 | 1.0UF                  | 50WV               |
| C80                   |               |                   | C91-0119-05       | CERAMIC                 | 0.047UF                | K                  |
| C81                   |               |                   | CC45SL1H101J      | CERAMIC                 | 100PF                  | J                  |

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|------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| C82 -84          |               |                   | CK45B1H102K       | CERAMIC 1000PF K        |                        |                    |
| C85              |               | *                 | C90-2022-05       | ELECTRØ 15UF 16WV       |                        |                    |
| C86 ,87          |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C88              |               |                   | CC45SL1H120J      | CERAMIC 12PF J          |                        |                    |
| C89              |               |                   | CQ92M1H152K       | MYLAR 1500PF K          |                        |                    |
| C90              |               |                   | CQ92M1H183K       | MYLAR 0.018UF K         |                        |                    |
| C91              |               |                   | CQ92M1H103K       | MYLAR 0.010UF K         |                        |                    |
| C92              |               |                   | CE04W1A220M       | ELECTRØ 22UF 10WV       |                        |                    |
| C93              |               |                   | CQ92M1H682K       | MYLAR 6800PF K          |                        |                    |
| C94              |               |                   | CE04W1H4R7M       | ELECTRØ 4.7UF 50WV      |                        |                    |
| C95              |               |                   | CC45SL1H470J      | CERAMIC 47PF J          |                        |                    |
| C95              |               |                   | CQ92M1H473K       | MYLAR 0.047UF K         |                        |                    |
| C96              |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C97              |               |                   | CC45SL1H390J      | CERAMIC 39PF J          |                        |                    |
| C99              |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C100             |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C101             |               |                   | CK45B1H102K       | CERAMIC 1000PF K        |                        |                    |
| C102             |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C103             |               |                   | CE04W1H100M       | ELECTRØ 10UF 50WV       |                        |                    |
| C104             |               |                   | CC45SL1H470J      | CERAMIC 47PF J          |                        |                    |
| C105             |               |                   | CK45B1H221K       | CERAMIC 220PF K         |                        |                    |
| C106             |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C107             |               |                   | CC45SL1H470J      | CERAMIC 47PF J          |                        |                    |
| C108             |               |                   | CE04W1H010M       | ELECTRØ 1.0UF 50WV      |                        |                    |
| C109             |               |                   | CE04W1HR47M       | ELECTRØ 0.47UF 50WV     |                        |                    |
| C110             |               |                   | CS15E1ER47M       | TANTAL 0.47UF 25WV      |                        |                    |
| C111             |               |                   | CE04W1H010M       | ELECTRØ 1.0UF 50WV      |                        |                    |
| C112             |               |                   | CE04W1H100M       | ELECTRØ 10UF 50WV       |                        |                    |
| C113             |               |                   | CE04W1H4R7M       | ELECTRØ 4.7UF 50WV      |                        |                    |
| C114             |               |                   | CE04W1H010M       | ELECTRØ 1.0UF 50WV      |                        |                    |
| C115             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C116             |               |                   | CC45SL1H101J      | CERAMIC 100PF J         |                        |                    |
| C117             |               |                   | CE04W1A470M       | ELECTRØ 47UF 10WV       |                        |                    |
| C118             |               |                   | CE04W1H010M       | ELECTRØ 1.0UF 50WV      |                        |                    |
| C119             |               |                   | CE04W1H100M       | ELECTRØ 10UF 50WV       |                        |                    |
| C120             |               |                   | CQ92M1H103K       | MYLAR 0.010UF K         |                        |                    |
| C121             |               |                   | CE04W1H010M       | ELECTRØ 1.0UF 50WV      |                        |                    |
| C122-124         |               |                   | CC45SL1H101J      | CERAMIC 100PF J         |                        |                    |
| C125             |               |                   | CE04W1H010M       | ELECTRØ 1.0UF 50WV      |                        |                    |
| C126             |               |                   | CE04W1H4R7M       | ELECTRØ 4.7UF 50WV      |                        |                    |
| C127,128         |               |                   | CE04W1H010M       | ELECTRØ 1.0UF 50WV      |                        |                    |
| C129             |               |                   | CE04W1A470M       | ELECTRØ 47UF 10WV       |                        |                    |
| C130             |               |                   | CE04W1H100M       | ELECTRØ 10UF 50WV       |                        |                    |
| C131             |               |                   | CE04W1H4R7M       | ELECTRØ 4.7UF 50WV      |                        |                    |
| C132,133         |               |                   | CE04W1H010M       | ELECTRØ 1.0UF 50WV      |                        |                    |
| C134             |               |                   | CE04W1A470M       | ELECTRØ 47UF 10WV       |                        |                    |
| C136             |               |                   | CE04W1A470M       | ELECTRØ 47UF 10WV       |                        |                    |
| C137             |               |                   | CK45B1H102K       | CERAMIC 1000PF K        |                        |                    |
| C138-140         |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C141             |               |                   | CE04W1A470M       | ELECTRØ 47UF 10WV       |                        |                    |
| C142             |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C143             |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C146             |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C147             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C148,149         |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |

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|------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| C150             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C151,152         |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C153             |               |                   | CC45SL1H470J      | CERAMIC 47PF J          |                        |                    |
| C154,155         |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C156             |               |                   | CC45SL1H180J      | CERAMIC 18PF J          |                        |                    |
| C158,159         |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C160             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C161             |               |                   | CC45SL1H470J      | CERAMIC 47PF J          |                        |                    |
| C162-165         |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C166             |               |                   | CE04W1H010M       | ELECTRØ 1.0UF 50WV      |                        |                    |
| C167             |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C168             |               |                   | CE04W1HR47M       | ELECTRØ 0.47UF 50WV     |                        |                    |
| C169             |               |                   | CQ92M1H472K       | MYLAR 4700PF K          |                        |                    |
| C170             |               |                   | CE04W1H100M       | ELECTRØ 10UF 50WV       |                        |                    |
| C171             |               |                   | CE04W1HR47M       | ELECTRØ 0.47UF 50WV     |                        |                    |
| C172             |               |                   | CE04W1C101M       | ELECTRØ 100UF 16WV      |                        |                    |
| C173             |               |                   | C90-0866-05       | ELECTRØ 470UF 6.3WV     |                        |                    |
| C174             |               |                   | CQ92M1H104K       | MYLAR 0.10UF K          |                        |                    |
| C175             |               |                   | C90-0864-05       | ELECTRØ 220UF 10WV      |                        |                    |
| C176             |               |                   | CQ92M1H103K       | MYLAR 0.010UF K         |                        |                    |
| C177             |               |                   | CE04W1HR47M       | ELECTRØ 0.47UF 50WV     |                        |                    |
| C178             |               |                   | CE04W1A470M       | ELECTRØ 47UF 10WV       |                        |                    |
| C179             |               |                   | CE04W1H4R7M       | ELECTRØ 4.7UF 50WV      |                        |                    |
| C180             |               |                   | CE04W1A470M       | ELECTRØ 47UF 10WV       |                        |                    |
| C181,182         |               |                   | CQ92M1H473K       | MYLAR 0.047UF K         |                        |                    |
| C183             |               |                   | CQ92M1H182K       | MYLAR 1800PF K          |                        |                    |
| C184             |               |                   | CK45B1H471K       | CERAMIC 470PF K         |                        |                    |
| C185             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C186             |               |                   | CC45UJ1H100D      | CERAMIC 10PF D          |                        |                    |
| C187             |               |                   | CK45B1H471K       | CERAMIC 470PF K         |                        |                    |
| C188             |               |                   | CC45SL1H330J      | CERAMIC 33PF J          |                        |                    |
| C189             |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C190             |               |                   | CC45SL1H050C      | CERAMIC 5.0PF C         |                        |                    |
| C191             |               |                   | CC45SL1H030C      | CERAMIC 3.0PF C         |                        |                    |
| C194             |               |                   | C91-0117-05       | CERAMIC 0.01UF K        |                        |                    |
| C196             |               |                   | CK45B1H561K       | CERAMIC 560PF K         |                        |                    |
| C197             |               |                   | CE04W1A470M       | ELECTRØ 47UF 10WV       |                        |                    |
| C198             |               |                   | CK45F1H223Z       | CERAMIC 0.022UF Z       |                        |                    |
| C199,200         |               |                   | CE04W1A470M       | ELECTRØ 47UF 10WV       |                        |                    |
| C201             |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C202             |               |                   | CK45F1H223Z       | CERAMIC 0.022UF Z       |                        |                    |
| C203             |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| C204             |               |                   | C91-1008-05       | CERAMIC 0.022UF K       |                        |                    |
| C205             |               |                   | C91-0769-05       | CERAMIC 0.01UF M        |                        |                    |
| C206             |               |                   | CE04W1H100M       | ELECTRØ 10UF 50WV       |                        |                    |
| C207             |               |                   | CK45B1H222K       | CERAMIC 2200PF K        |                        |                    |
| C208             |               |                   | CE04W1H100M       | ELECTRØ 10UF 50WV       |                        |                    |
| C209,210         |               |                   | C91-0119-05       | CERAMIC 0.047UF K       |                        |                    |
| TC1              |               |                   | C05-0315-05       | TRIMMING CAP (60P)      |                        |                    |
| TC2              |               |                   | C05-0030-15       | TRIMMING CAP (20P)      |                        |                    |
| -                |               |                   | E40-0273-05       | PIN CONNECTOR (MINI,2P) |                        |                    |
| -                |               |                   | E40-0373-05       | PIN CONNECTOR (MINI,3P) |                        |                    |
| -                |               |                   | E40-0473-05       | PIN CONNECTOR (MINI,4P) |                        |                    |
| -                |               |                   | E40-0573-05       | PIN CONNECTOR (MINI,5P) |                        |                    |
| -                |               |                   | E40-0673-05       | PIN CONNECTOR (MINI,6P) |                        |                    |

## PARTS LIST

\* New Parts

Parts without Parts No. are not supplied.

Les articles non mentionnés dans le Parts No. ne sont pas fournis.

Telle ohne Parts No. werden nicht geliefert.

| Ref. No.<br>参照番号 | Address<br>位置 | New<br>Parts<br>新 | Parts No.<br>部品番号 | Description<br>部品名 / 規格         | Desti-<br>nation<br>仕向 | Re-<br>marks<br>備考 |
|------------------|---------------|-------------------|-------------------|---------------------------------|------------------------|--------------------|
| -                |               |                   | E40-0773-05       | PIN CONNECTOR (MINI,7P)         |                        |                    |
| -                |               |                   | E40-0973-05       | PIN CONNECTOR (MINI,9P)         |                        |                    |
| -                |               |                   | E40-1073-05       | PIN CONNECTOR (MINI,10P)        |                        |                    |
| -                |               |                   | F02-0424-04       | HEAT SINK                       |                        |                    |
| CF1              |               | *                 | L72-0356-05       | CERAMIC FILTER                  |                        |                    |
| CF2              |               | *                 | L72-0355-05       | CERAMIC FILTER                  |                        |                    |
| CF3              |               |                   | L72-0315-05       | CERAMIC FILTER                  |                        |                    |
| CF4              |               |                   | L72-0351-05       | CERAMIC FILTER                  |                        |                    |
| L1               |               |                   | L34-0708-05       | COIL                            |                        |                    |
| L2               |               |                   | L34-0943-05       | COIL                            |                        |                    |
| L3 ,4            |               |                   | L34-0664-05       | COIL                            |                        |                    |
| L5               |               |                   | L34-0945-05       | COIL                            |                        |                    |
| L6               |               |                   | L30-0503-05       | IFT                             |                        |                    |
| L7               |               |                   | L40-4711-13       | SMALL FIXED INDUCTOR            |                        |                    |
| L9               |               |                   | L40-1021-13       | SMALL FIXED INDUCTOR            |                        |                    |
| L10              |               |                   | L40-1511-14       | SMALL FIXED INDUCTOR            |                        |                    |
| L11              |               |                   | L40-1011-14       | SMALL FIXED INDUCTOR            |                        |                    |
| L12              |               |                   | L34-0535-05       | COIL                            |                        |                    |
| L13              |               |                   | L40-1011-14       | SMALL FIXED INDUCTOR            |                        |                    |
| L14              |               |                   | L40-3391-13       | SMALL FIXED INDUCTOR            |                        |                    |
| L15              |               |                   | L32-0201-05       | OSCILLATING COIL                |                        |                    |
| L16              |               |                   | L40-3392-02       | SMALL FIXED INDUCTOR            |                        |                    |
| L18              |               |                   | L34-2124-05       | COIL                            |                        |                    |
| L19              |               |                   | L40-1021-03       | SMALL FIXED INDUCTOR            |                        |                    |
| L20              |               |                   | L40-1011-14       | SMALL FIXED INDUCTOR            |                        |                    |
| L21              |               |                   | L40-6825-04       | SMALL FIXED INDUCTOR            |                        |                    |
| X1               |               | *                 | L77-1302-05       | CRYSTAL RESONATOR               |                        |                    |
| -                |               |                   | N09-0641-05       | SCREW                           |                        |                    |
| -                |               |                   | N30-3004-46       | PAN HEAD MACHINE SCREW          |                        |                    |
| VR1              |               | *                 | R12-7407-05       | TRIMMING POT. (500K)            |                        |                    |
| VR2              |               |                   | R12-3447-05       | TRIMMING POT. (10K)S-METER,SSB  |                        |                    |
| VR3              |               |                   | R12-4414-05       | TRIMMING POT. (50K)S-METER      |                        |                    |
| VR4 ,5           |               |                   | R12-2414-05       | TRIMMING POT. (5K)VOLTAGE,ETC.  |                        |                    |
| VR6              |               |                   | R12-5417-05       | TRIMMING POT. (100K)SPEECH PROC |                        |                    |
| VR7              |               |                   | R12-2414-05       | TRIMMING POT. (5K)CARRIER SUP   |                        |                    |
| VR8              |               |                   | R12-3447-05       | TRIMMING POT. (10K)CARRIER SUP  |                        |                    |
| VR9 ,10          |               |                   | R12-4414-05       | TRIMMING POT. (50K)CW SIDE TONE |                        |                    |
| W9               |               |                   | R92-0150-05       | JUMPER REST 0 OHM               |                        |                    |
| W24              |               |                   | R92-0150-05       | JUMPER REST 0 OHM               |                        |                    |
| W43 ,44          |               |                   | R92-0150-05       | JUMPER REST 0 OHM               |                        |                    |
| W49              |               |                   | R92-0150-05       | JUMPER REST 0 OHM               |                        |                    |
| W51 ,52          |               |                   | R92-0150-05       | JUMPER REST 0 OHM               |                        |                    |
| W55              |               |                   | R92-0150-05       | JUMPER REST 0 OHM               |                        |                    |
| D1 -6            |               |                   | 1S1007            | DIODE                           |                        |                    |
| D7 ,8            |               |                   | 1S1587            | DIODE                           |                        |                    |
| D9               |               |                   | 1SS133            | DIODE                           |                        |                    |
| D10              |               |                   | 1S1587            | DIODE                           |                        |                    |
| D11              |               |                   | 1SS133            | DIODE                           |                        |                    |
| D12 -18          |               |                   | 1S1587            | DIODE                           |                        |                    |
| D19 -22          |               |                   | 1N60              | DIODE                           |                        |                    |
| D23 -29          |               |                   | 1SS133            | DIODE                           |                        |                    |
| D30              |               |                   | 1N60              | DIODE                           |                        |                    |
| D31 -34          |               |                   | 1SS133            | DIODE                           |                        |                    |

## PARTS LIST

× New Parts

Parts without Parts No. are not supplied.

Les articles non mentionnés dans le Parts No. ne sont pas fournis.

Teile ohne Parts No. werden nicht geliefert.

| Ref. No.<br>参照番号 | Address<br>位置 | New<br>Parts<br>新 | Parts No.<br>部品番号 | Description<br>部品名 / 規格 | Desti-<br>nation<br>仕向 | Re-<br>marks<br>備考 |
|------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| D35              |               |                   | 1N60              | DIODE                   |                        |                    |
| D36              |               |                   | 1S1587            | DIODE                   |                        |                    |
| D37 ,38          |               |                   | 1S1555            | DIODE                   |                        |                    |
| D39              |               |                   | 1N60              | DIODE                   |                        |                    |
| D40              |               |                   | 1S1555            | DIODE                   |                        |                    |
| D41              |               |                   | 1SS133            | DIODE                   |                        |                    |
| D42 ,43          |               |                   | 1N60              | DIODE                   |                        |                    |
| D45 ,46          |               |                   | 1SS133            | DIODE                   |                        |                    |
| D47              |               |                   | MI204             | DIODE                   |                        |                    |
| D48 ,49          |               |                   | 1SS133            | DIODE                   |                        |                    |
| D50              |               |                   | 1S1587            | DIODE                   |                        |                    |
| D51              |               |                   | MTZ9. 1JB         | DIODE                   |                        |                    |
| D52              |               |                   | V06B              | DIODE                   |                        |                    |
| D53 ,54          |               |                   | 1S1587            | DIODE                   |                        |                    |
| D55              |               |                   | MTZ6. 2JA         | DIODE                   |                        |                    |
| D56 -59          |               |                   | 1SS133            | DIODE                   |                        |                    |
| D60              |               |                   | MC921             | DIODE                   |                        |                    |
| D61              |               | *                 | DAN401            | DIODE ARRAY             |                        |                    |
| D62              |               |                   | MC921             | DIODE                   |                        |                    |
| D63              |               |                   | 1SS133            | DIODE                   |                        |                    |
| D65 ,66          |               |                   | 1S1555            | DIODE                   |                        |                    |
| D67              |               |                   | 1SS101            | DIODE                   |                        |                    |
| D68 -72          |               |                   | MC921             | DIODE                   |                        |                    |
| D74 ,75          |               |                   | MC921             | DIODE                   |                        |                    |
| D76 -80          |               |                   | 1SS133            | DIODE                   |                        |                    |
| D81              |               |                   | 1S1555            | DIODE                   |                        |                    |
| D82 -84          |               |                   | 1SS133            | DIODE                   |                        |                    |
| IC1              |               |                   | BX7191            | IC (NOTCH/PEAK FILTER)  |                        |                    |
| IC2              |               |                   | MC3357P           | IC                      |                        |                    |
| IC3              |               | *                 | M74LS123P         | IC (DUAL MONO MULTI)    |                        |                    |
| IC3              |               | *                 | SN74LS123N        | IC                      |                        |                    |
| IC4              |               |                   | UPC1158H2         | IC                      |                        |                    |
| IC5 ,6           |               |                   | AN612             | IC (BALANCED MODULATOR) |                        |                    |
| IC7              |               |                   | UPC2002V          | IC (OPE AMP X2)         |                        |                    |
| IC8 ,9           |               | *                 | M74LS00P          | IC                      |                        |                    |
| IC8 ,9           |               |                   | SN74LS00N         | IC                      |                        |                    |
| IC10             |               |                   | BX6124            | IC (2CH SWITCHING IC)   |                        |                    |
| Q1 ,2            |               |                   | 3SK73 (GR)        | FET                     |                        |                    |
| Q3               |               |                   | 2SC2458 (Y)       | TRANSISTOR              |                        |                    |
| Q4               |               |                   | DTC114ES          | DIGITAL TRANSISTOR      |                        |                    |
| Q5               |               |                   | 3SK73 (GR)        | FET                     |                        |                    |
| Q6               |               |                   | DTC114ES          | DIGITAL TRANSISTOR      |                        |                    |
| Q7 ,8            |               |                   | 3SK73 (GR)        | FET                     |                        |                    |
| Q9               |               |                   | 2SC2458 (Y)       | TRANSISTOR              |                        |                    |
| Q10              |               |                   | 2SC2459 (BL)      | TRANSISTOR              |                        |                    |
| Q11              |               |                   | DTC114ES          | DIGITAL TRANSISTOR      |                        |                    |
| Q12              |               |                   | 2SC2459 (BL)      | TRANSISTOR              |                        |                    |
| Q13              |               |                   | DTC114ES          | DIGITAL TRANSISTOR      |                        |                    |
| Q14              |               |                   | DTC143TS          | DIGITAL TRANSISTOR      |                        |                    |
| Q15              |               |                   | DTC114ES          | DIGITAL TRANSISTOR      |                        |                    |
| Q16              |               |                   | 2SC2459 (BL)      | TRANSISTOR              |                        |                    |
| Q17              |               |                   | 2SC2458 (Y)       | TRANSISTOR              |                        |                    |
| Q18              |               |                   | 2SA1048 (Y)       | TRANSISTOR              |                        |                    |
| Q19              |               |                   | 2SC2458 (Y)       | TRANSISTOR              |                        |                    |
| Q20              |               |                   | 2SK192 (GR)       | FET                     |                        |                    |

## PARTS LIST

× New Parts

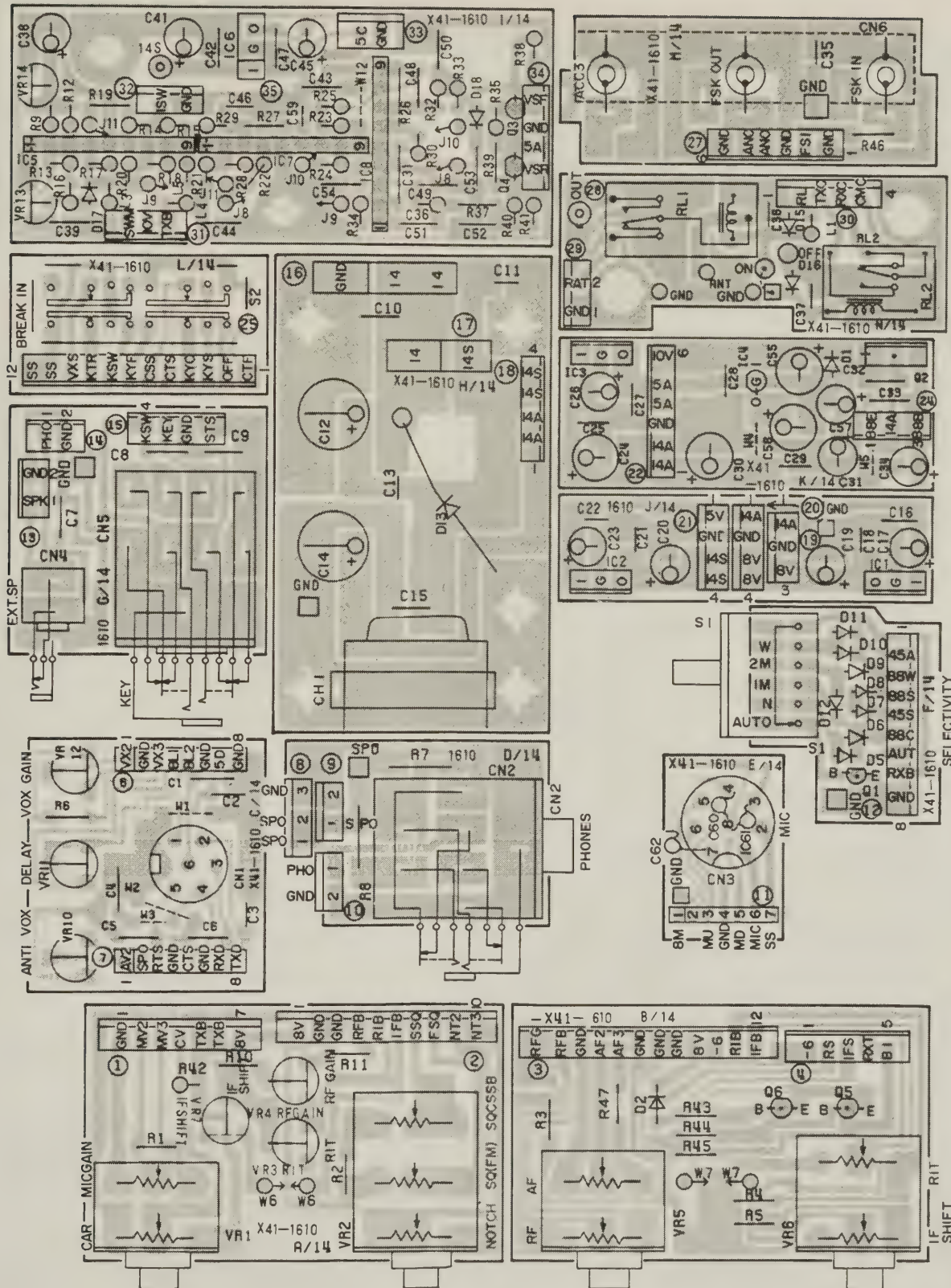
Parts without Parts No. are not supplied.

Les articles non mentionnés dans le Parts No. ne sont pas fournis.

Teile ohne Parts No. werden nicht geliefert.

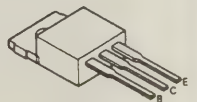
| Ref. No.<br>参照番号 | Address<br>位置 | New<br>Parts<br>新 | Parts No.<br>部品番号 | Description<br>部品名 / 規格 | Desti-<br>nation<br>仕向 | Re-<br>marks<br>備考 |
|------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| Q21              |               |                   | 2SA1048(Y)        | TRANSISTOR              |                        |                    |
| Q22              |               |                   | DTC114ES          | DIGITAL TRANSISTOR      |                        |                    |
| Q23 ,24          |               |                   | 2SC2458(Y)        | TRANSISTOR              |                        |                    |
| Q25 ,26          |               |                   | 2SK30A(Ø)         | FET                     |                        |                    |
| Q27              |               |                   | 2SA1048(Y)        | TRANSISTOR              |                        |                    |
| Q28              |               |                   | DTC114ES          | DIGITAL TRANSISTOR      |                        |                    |
| Q29 -32          |               |                   | DTC143TS          | DIGITAL TRANSISTOR      |                        |                    |
| Q33              |               | *                 | 2SA562TM          | TRANSISTOR              |                        |                    |
| Q34              |               |                   | 2SC2458(Y)        | TRANSISTOR              |                        |                    |
| Q35              |               | *                 | 2SA562TM          | TRANSISTOR              |                        |                    |
| Q36 ,37          |               |                   | DTC114ES          | DIGITAL TRANSISTOR      |                        |                    |
| Q38              |               | *                 | 2SA562TM          | TRANSISTOR              |                        |                    |
| Q39              |               |                   | DTC114ES          | DIGITAL TRANSISTOR      |                        |                    |
| Q40              |               |                   | 2SC2459(BL)       | TRANSISTOR              |                        |                    |
| Q41              |               |                   | DTC114ES          | DIGITAL TRANSISTOR      |                        |                    |
| Q42              |               |                   | 2SC2458(Y)        | TRANSISTOR              |                        |                    |
| Q43              |               |                   | DTA114ES          | DIGITAL TRANSISTOR      |                        |                    |
| Q44              |               |                   | 2SC2459(BL)       | TRANSISTOR              |                        |                    |
| Q45              |               |                   | 2SC2458(Y)        | TRANSISTOR              |                        |                    |
| Q46              |               |                   | 3SK73(GR)         | FET                     |                        |                    |
| Q47 ,48          |               |                   | DTC143TS          | DIGITAL TRANSISTOR      |                        |                    |
| Q49              |               |                   | 2SA1048(Y)        | TRANSISTOR              |                        |                    |
| Q50              |               |                   | DTC114ES          | DIGITAL TRANSISTOR      |                        |                    |
| Q51              |               |                   | DTC143TS          | DIGITAL TRANSISTOR      |                        |                    |
| Q52              |               |                   | 2SC2459(BL)       | TRANSISTOR              |                        |                    |
| Q53 ,54          |               |                   | 2SC2458(Y)        | TRANSISTOR              |                        |                    |
| Q55              |               |                   | DTC114ES          | DIGITAL TRANSISTOR      |                        |                    |
| TH1 ,2           |               |                   | 112-502-2         | THERMISTOR              |                        |                    |
| TH3              |               |                   | 32D27             | THERMISTOR              |                        |                    |
| -                |               | *                 | X59-1060-00       | SIDE TONE UNIT          |                        |                    |
| -                |               | *                 | X59-1070-00       | SELECTIVITY UNIT        |                        |                    |
| -                |               | *                 | X59-1080-00       | VOX UNIT                |                        |                    |

## SWITCH UNIT (X41-1610-00) Component side view



IC1: AN7808, IC2, 3, 6: AN7805, IC4: LM2931Z-5.0, IC5, 8: NJM2904S, IC7: NJM2903S, Q1: DTC114ES, Q2: 2SD1406(Y), Q3, 4: 2SK30(GR), Q5, 6: 2SC2458(Y), D1: 1S1555, D2: MTZ7. 5JA, D5~12, 15~18: 1SS133, D13: S31C

2SD1406(Y)



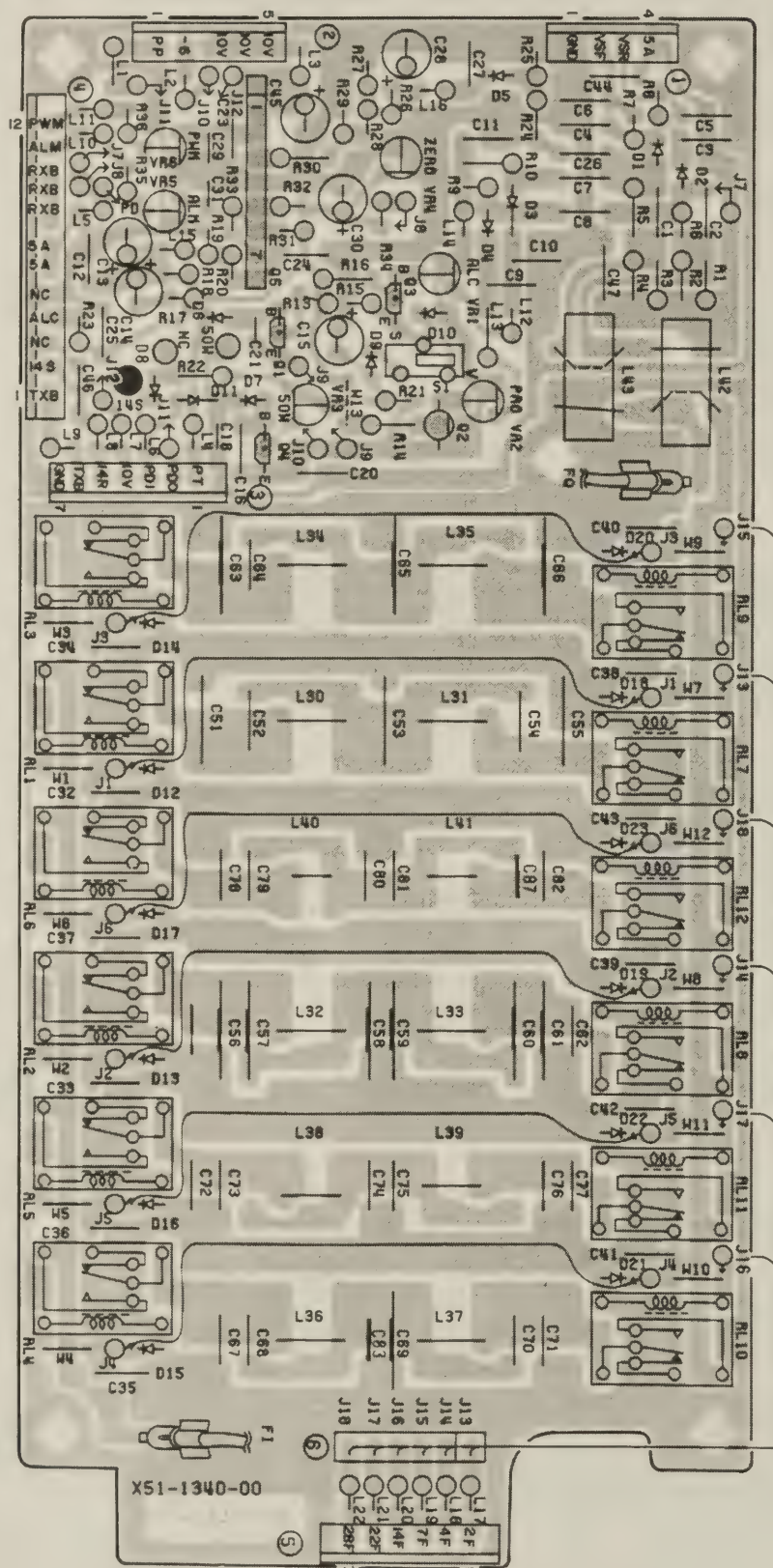
2SC2458(Y)  
DTC114ES



2SK30(GR)



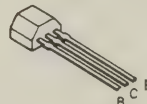
## FILTER UNIT (X51-1340-00) Component side view



2SC1815(Y)



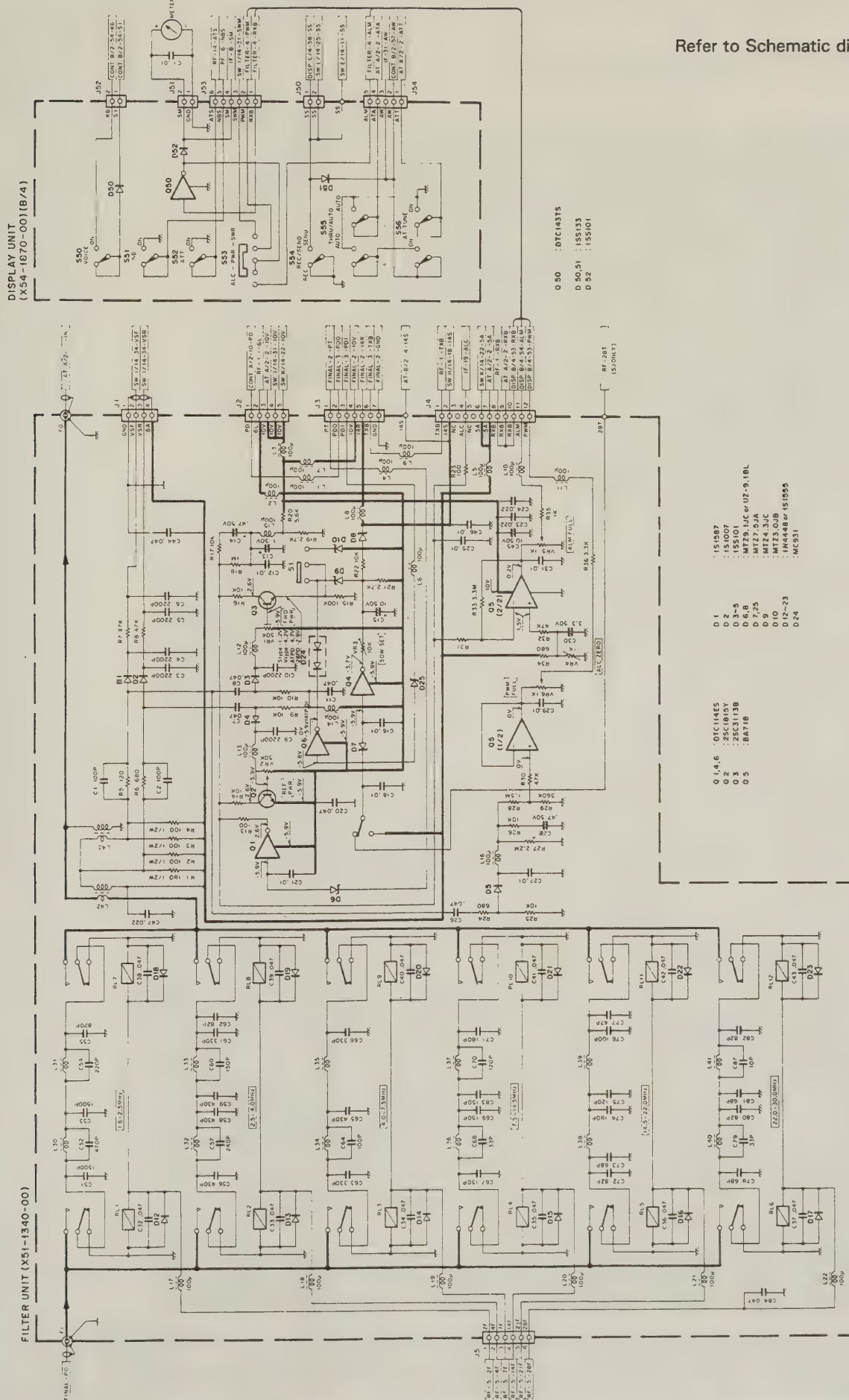
2SC3113  
DTC114ES



Q1, 4, 6: DTC114ES, Q2: 2SC1815(Y),  
Q3: 2SC3113(B), Q5: BA718, D1: 1S1587,  
D2: 1S1007, D3~5: 1S1001, D6, 8: MT29.1JC  
or UZ9.1BL, D7, 25: MT27.5JA, D9: MT24.3JC,  
D10: MT23.0JB, D12~23: 1N4448 or 1S1555,  
D23: MC931

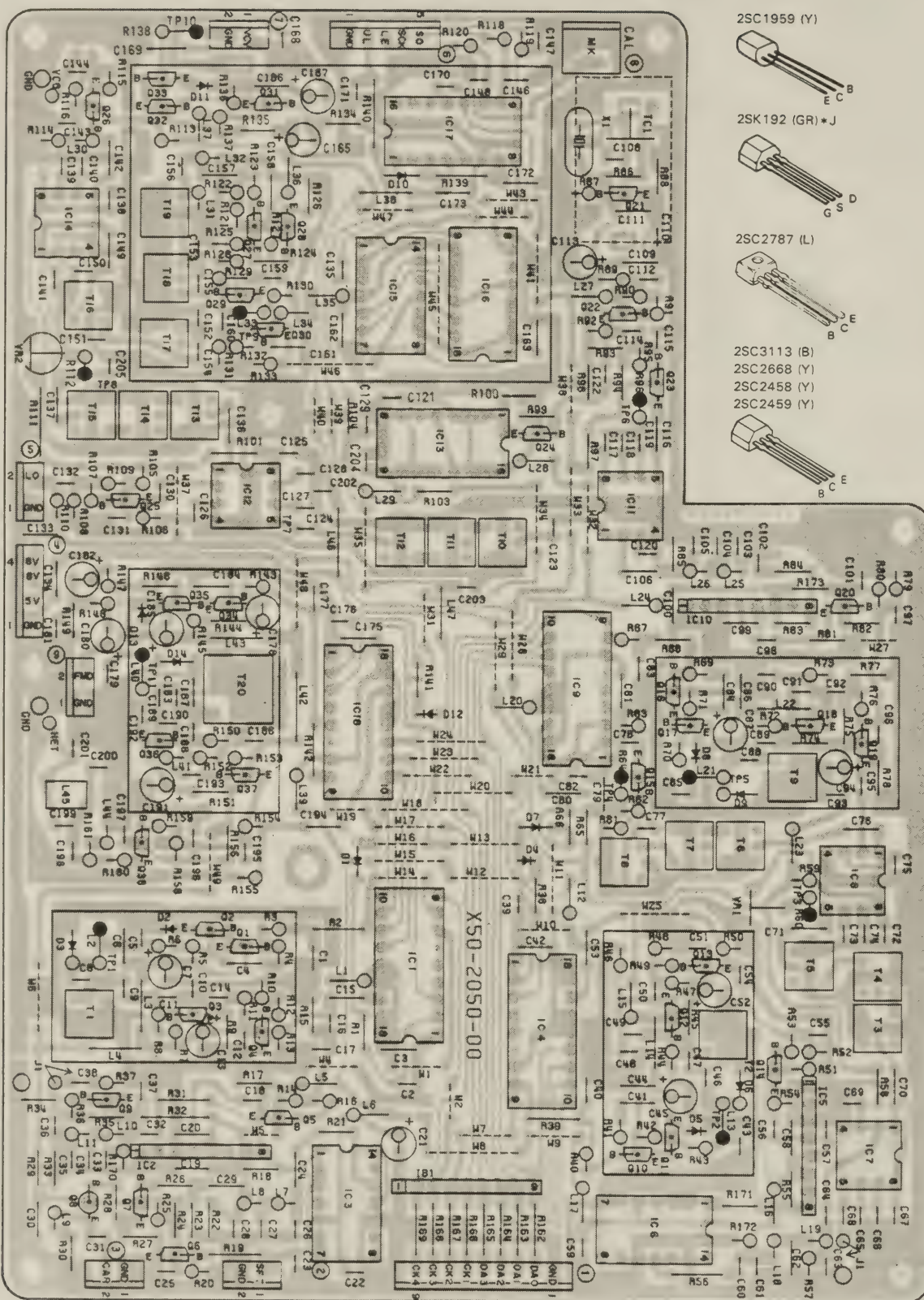
## FILTER UNIT (X51-1340-00)

Refer to Schematic diagram on page 113.

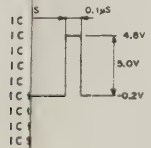


# TS-440S PC BOARD VIEW

PLL UNIT (X50-2050-00) Component side view



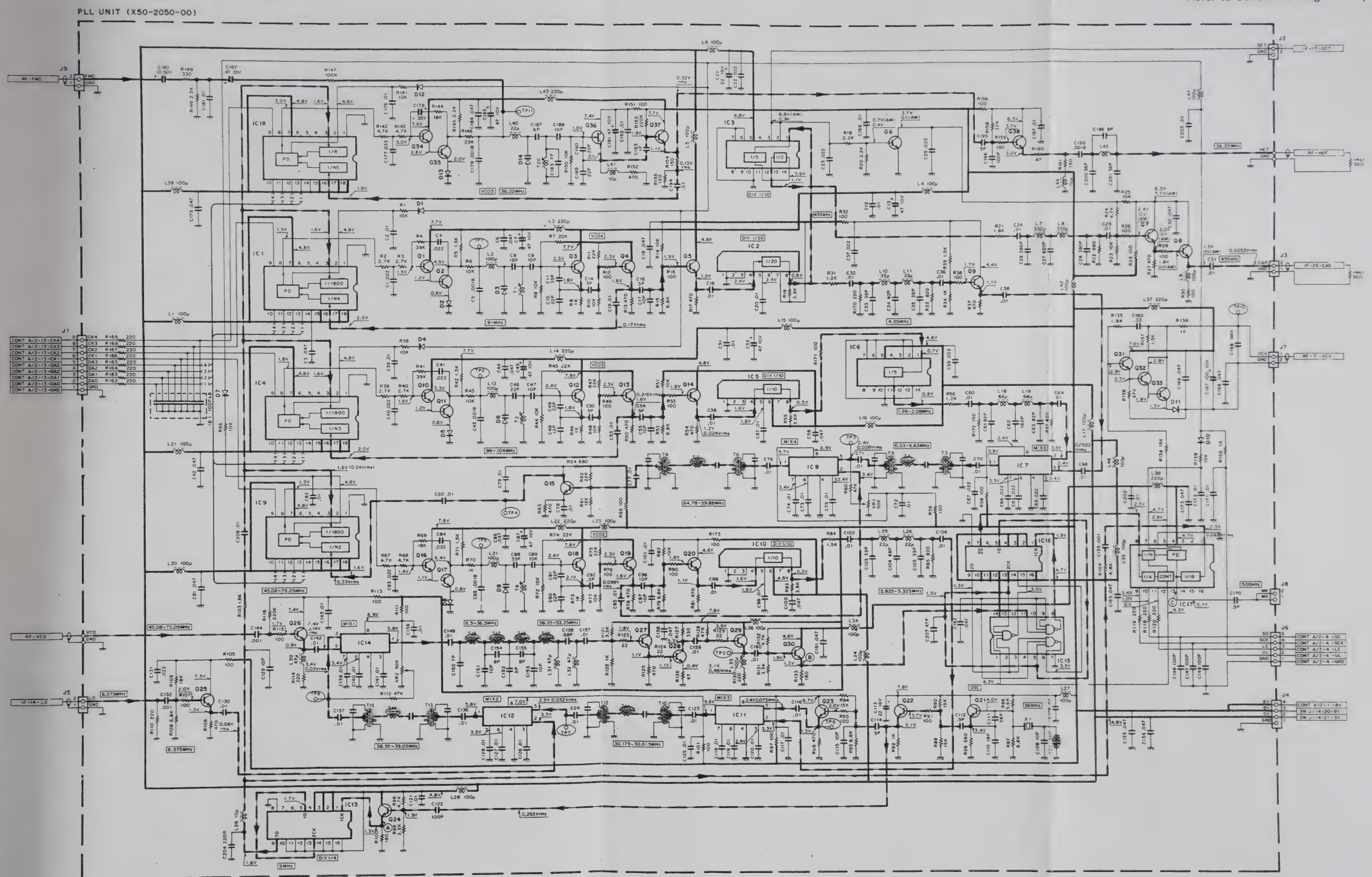
IC1, 4, 9, 18: NM6147, IC2: M54459L, IC3, 6: SN74LS90N, IC5, 10: M54460L, IC7, 8, 11, 12, 14: SN16913P, IC13, 16: SN74S112N, IC15: SN74S10N, IC17: MB87006, Q1, 2, 10, 11, 16, 17: 2SC3113(B), Q3~5, 12~15, 18~20, 22~24, 26~30, 37: 2SC2668(Y) Q6, 7, 9, 25: 2SC2458(Y), Q8: 2SC1959(Y), Q21: 2SC2787(L), Q31~35: 2SC2459(BL) Q36: 2SK192A (GR)\*J





Refer to Schematic diagram on page 113.

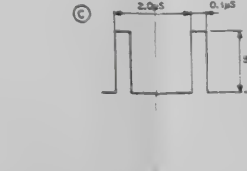
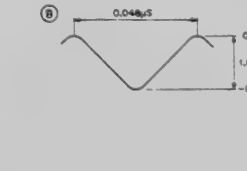
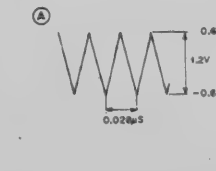
## PLL UNIT (X50-2050-00) Component side view



- IC 1,4 : MN6147 or MN6147C
- IC 2 : M54459L
- IC 3,6 : SN74LS90N
- IC 7,8,11,12,14 : SN16913P
- IC 5,10 : M54460L
- IC 13,16 : SN74S112N
- IC 15 : SN74S10N
- IC 17 : MB97006
- IC 9,18 : MN6147

- Q 1,2,10,11,16,17 : 2SC313(B)
- Q 3-5,12-15,18-20,22-24,26-30 : 2SC2668(Y)
- Q 37,38 : 2SC2458(Y)
- Q 6,7,9,25 : 2SC1959(Y)
- Q 8 : 2SC2787(L)
- Q 21 : 2SC2459(BL)
- Q 31-35 : 2SK1924(GR)
- Q 36 : 2SK1924(GR)

- D 1,2,4,5,7,8,10,12 : 1SS133
- D 3 : 1SV53A
- D 6,9 : 1TT310TE
- D 11 : MV13
- D 13 : MV203
- D 14 : 1SV153

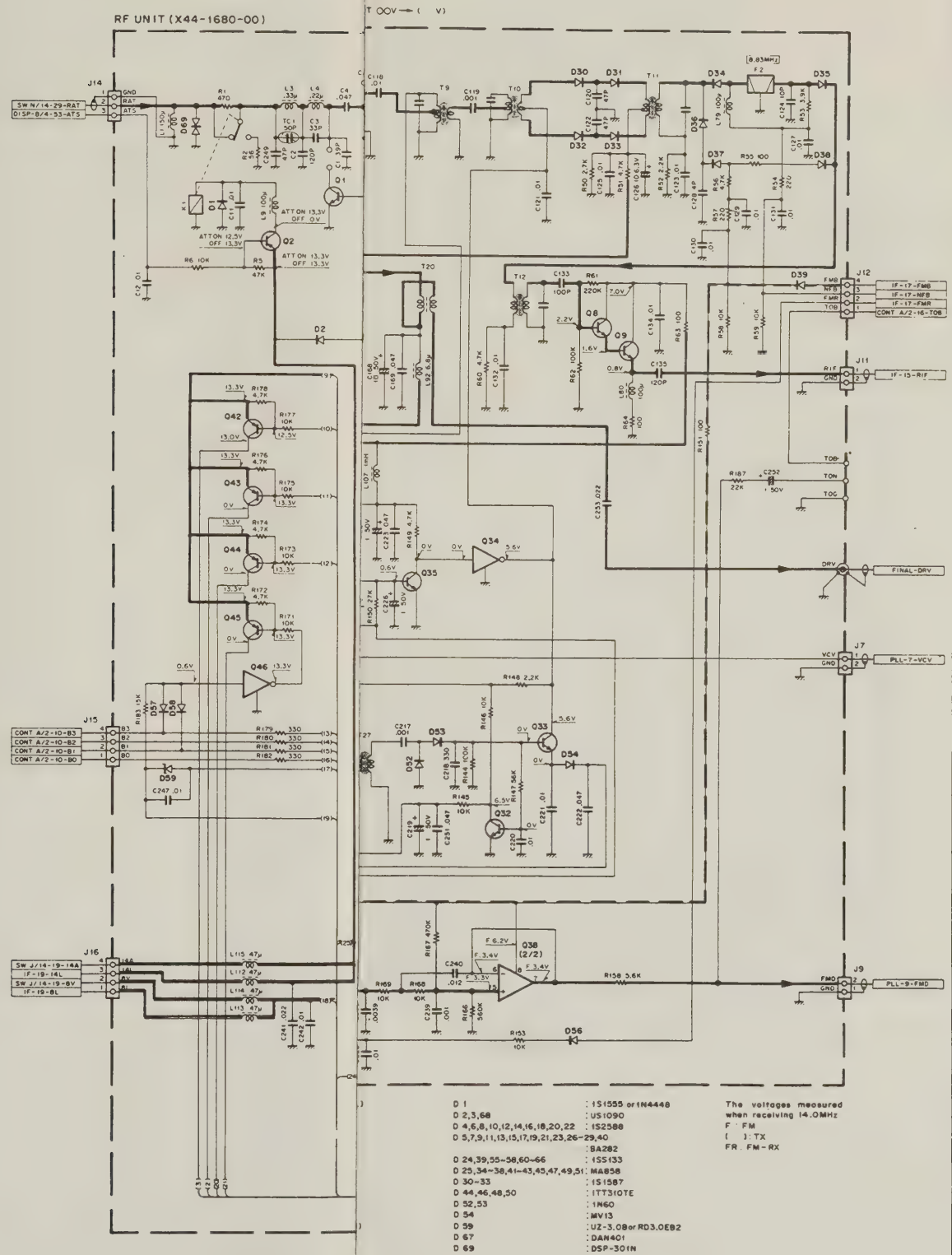




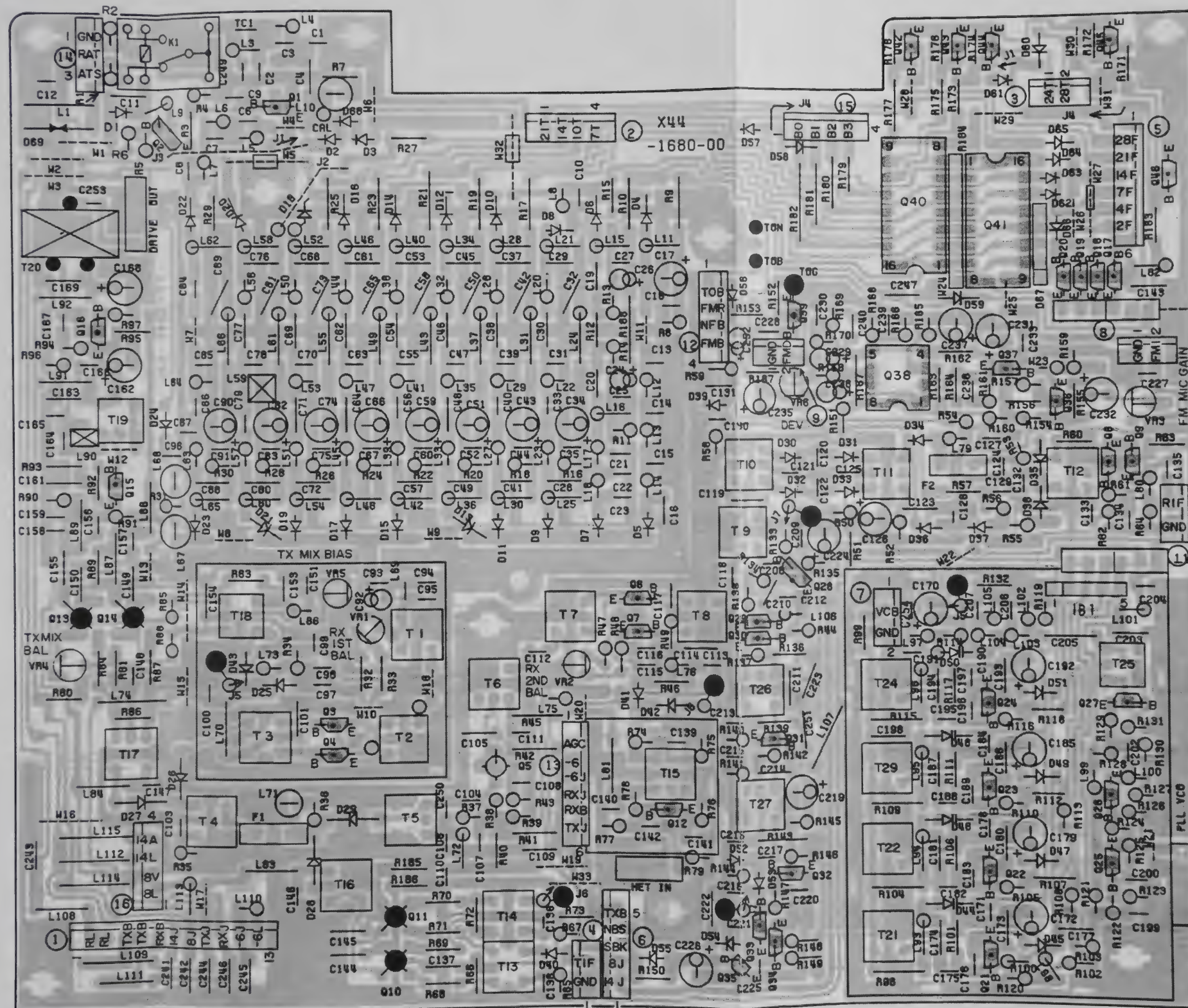
# CIRCUIT DIAGRAM TS-440S

Refer to Schematic diagram on page 113.

## RF UNIT (X44-1680-00)



RF UNIT (X44-1680-00) Component side view

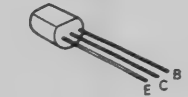


Q1, 36: 2SC2459(BL), Q2, 45: 2SA562(Y), Q3, 4, 6, 7: 2SK125-5, Q5: 3SK74(L), Q8, 9, 12, 21~25, 29~31: 2SC2668(Y), Q10, 11, 13, 14: 3SK122(L), Q15: 2SC2570A, Q16: 2SC2538, Q17~20: DTC143TS, Q26: 2SC1959(Y), Q27: 2SC2053, Q28: 2SK192A(GR), Q32, 33, 35, 37, 39: 2SC2603(E), Q34, 46: DTC124ES, Q38: PC4558C, Q40: M74LS145P or SN74LS145N, Q41: M54561P, D1: 1S1555, D2, 3: US1090, D4, 6, 8, 10, 12, 14, 16, 18, 20, 22: 1S2588, D5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 26~29, 40: BA282, D24, 39, 56~58, 60, 66: 1SS133, D25, 34~38, 41~43, 45, 47, 49, 51: MA858, D30~33: 1S1587, D44, 46, 48, 50: ITT310TE, D52, 53: 1N60, D54: MV13, D59: VZ3.0B, D67: DAN401, D68: US1090, D69: DSP-301N

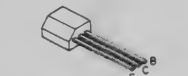
2SC2538  
2SC2053



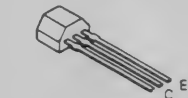
2SC1959 (Y)  
2SA562 (Y)



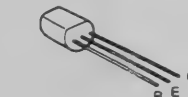
DTC124ES



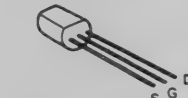
2SC2459 (BL)  
2SC2668 (Y)  
2SC2603 (E)  
DTC143TS



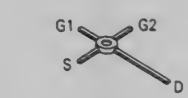
2SC2570A



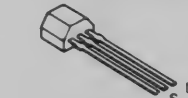
2SK125-5



3SK74 (L)  
3SK122 (L)



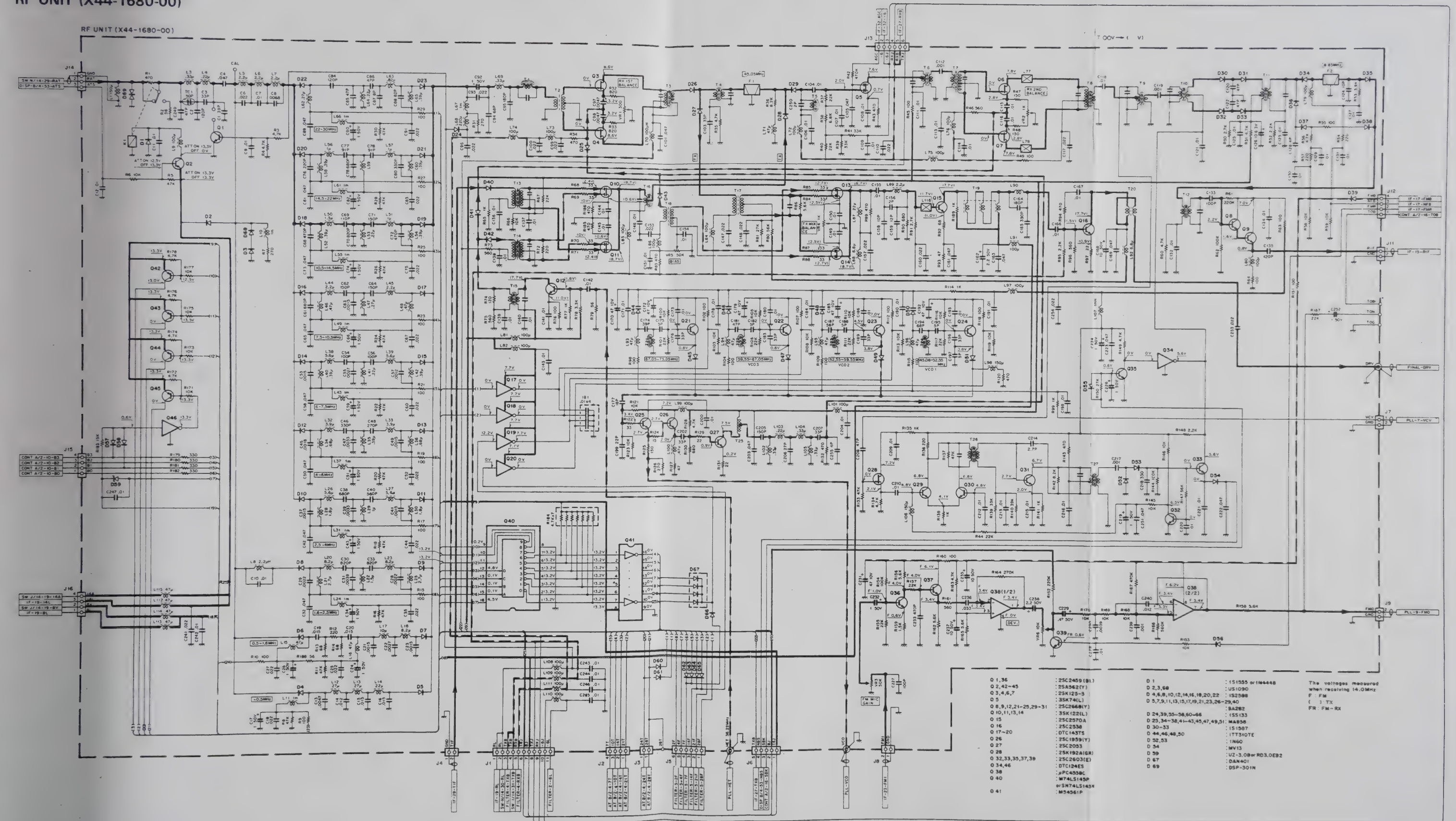
2SK192A (GR)



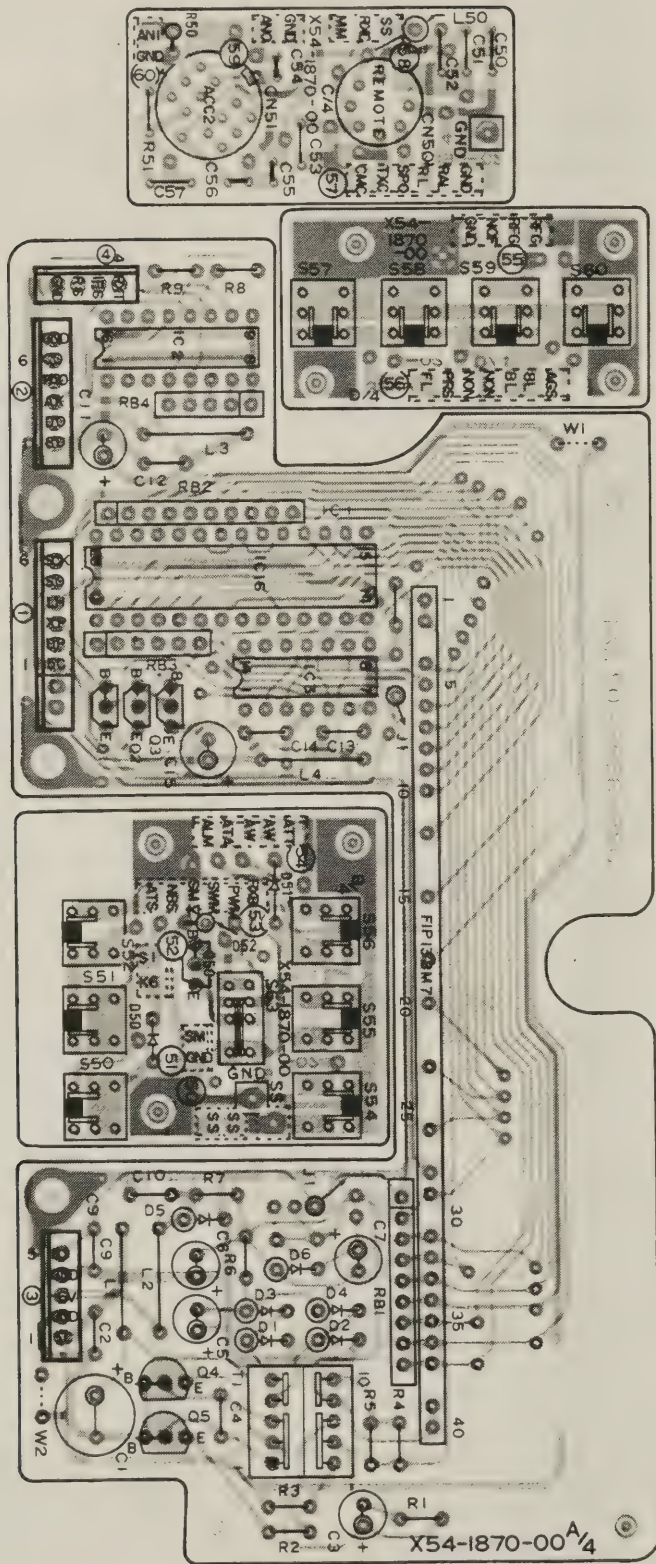
Refer to Schematic diagram on page 113.

## RF UNIT (X44-1680-00)

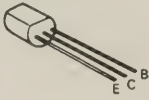
RF UNIT (X44-1680-00)



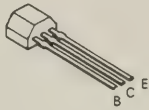
DISPLAY UNIT (X54-1870-00) Component side view



2SC1959 (Y)

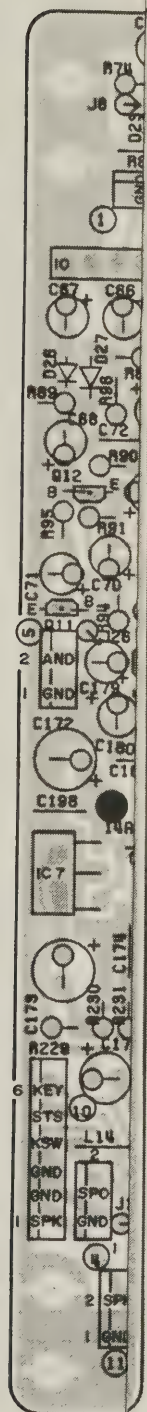


DTA114ES  
DTC144WS  
DTC143TS



IC1:  $\mu$ PD6300C, IC2: MB4052, IC3: TC4013BP, Q1, 2: DTA114ES, Q3: DTC114WS, Q4, 5: 2SC1959 (Y), Q50: DTC143TS, D1~4: 1S1555, D5, 6: MTZ6.2JA, D50, 51: 1SS133, D52: 1SS101

IF UNIT (X

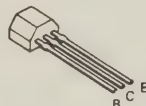


IC1: BX719  
9: M74LS00  
(Y), Q4, 6,  
47, 48, 51:  
D1~6: 1S1  
82~84: 1S1  
D52: V06B,

2SA562TM



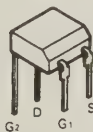
2SC2458 (Y)  
2SC2459 (Y)  
2SA1048 (Y)  
DTC114ES  
DTC143TS



2SK30A (O)



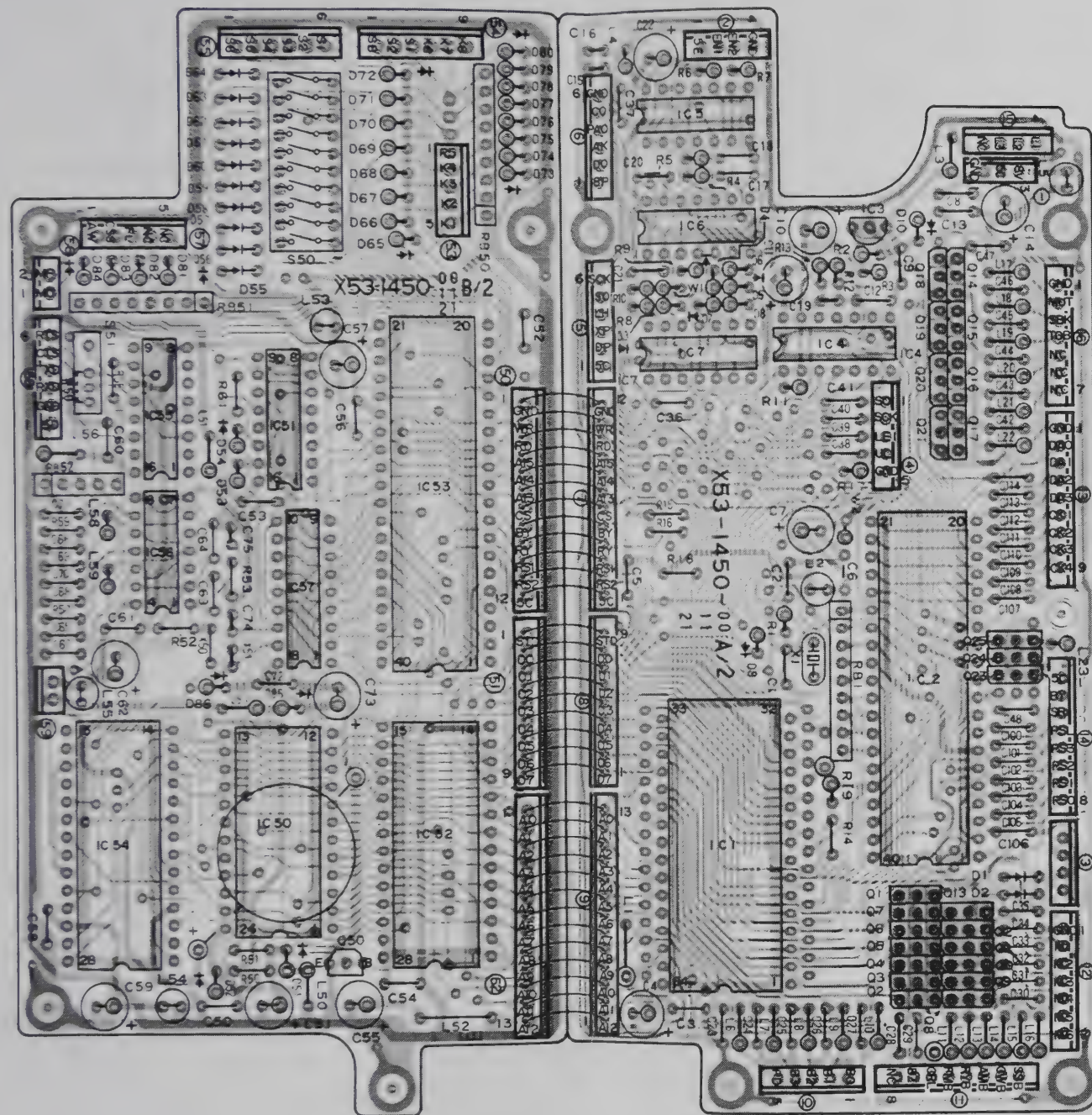
3SK73 (GR)



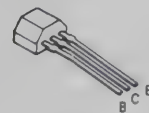
2SK192 (GR)



**CONTROL UNIT (X53-1450-00, 11, 12) Component side view**

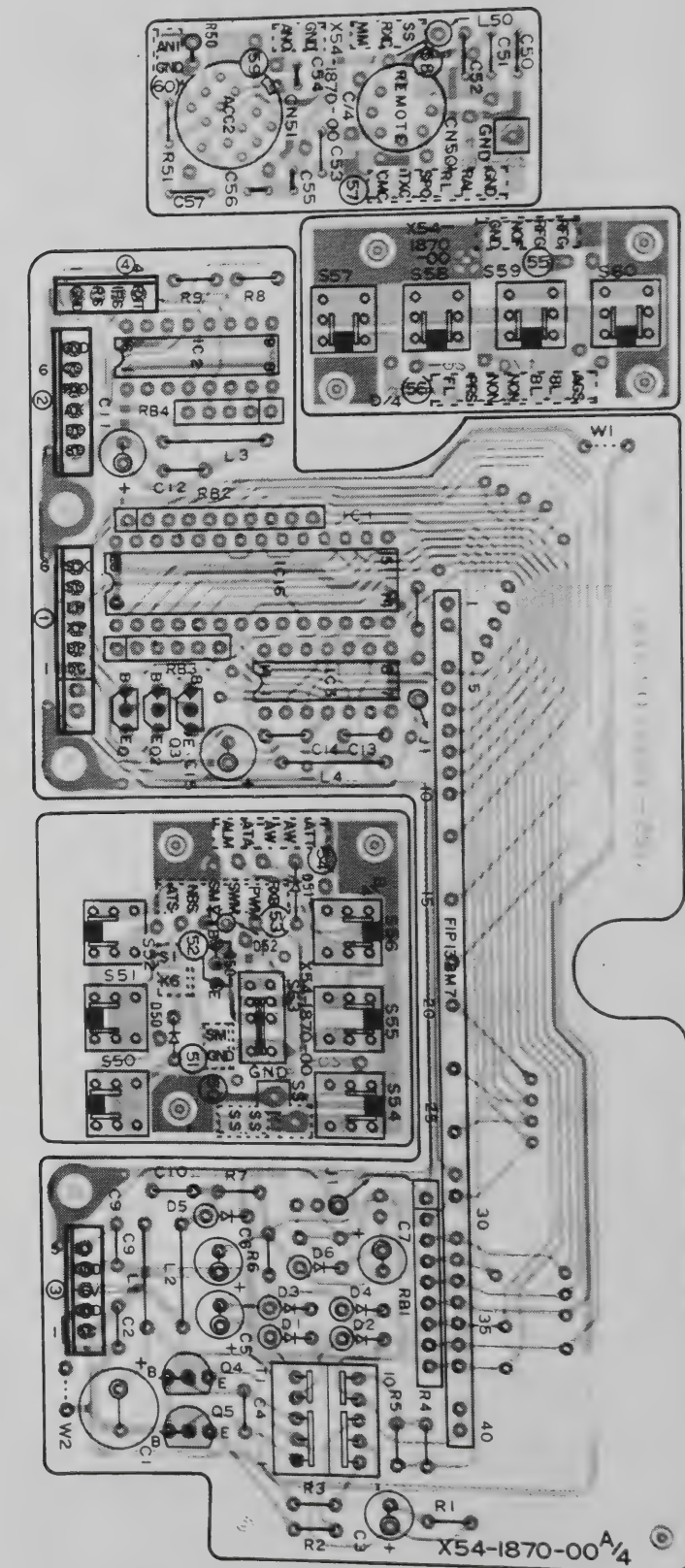


DTC144WS  
DTA114ES



IC1:  $\mu$ PD7800G, IC2, 53: TMP8225AP-5 or  $\mu$ PD8255AC-5, IC3: PST520D, IC4: TC4069UB, IC5, 7: TC4011BP, IC6: TC4030BP, IC20: MB8418-20LP-GRA, IC51: SN74LS138N, IC52: MBM27128-25JA1, IC56: SN7404N, Q1~7, 14, 50: DTC144WS, Q8~13, 18~24, 25: DTA114ES, D1, 2, 5~9, 51~71, 73, 75, 82~84: 1SS133, D81: 1SS101

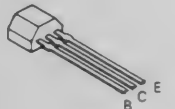
**DISPLAY UNIT (X54-1870-00) Component side view**



2SC1959 (Y)



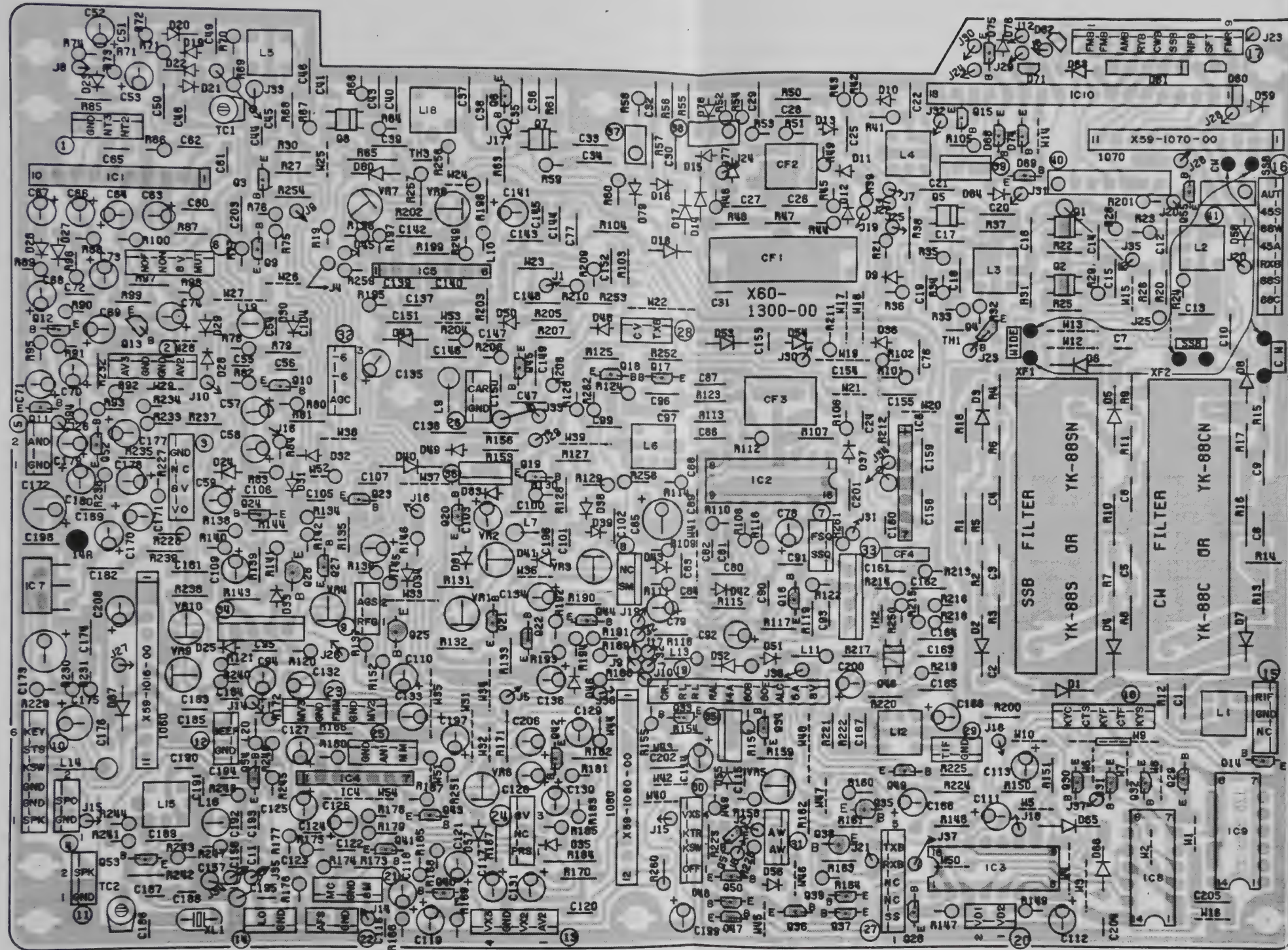
DTA114ES  
DTC144WS  
DTC143TS



IC1:  $\mu$ PD6300C, IC2: MB4052, IC3: TC4013BP, Q1, 2: DTA114ES, Q3: DTC114WS, Q4, 5: 2SC1959 (Y), Q50: DTC143TS,  
D1~4: 1S1555, D5, 6: MTZ6.2JA, D50, 51: 1SS133, D52: 1SS101

# TS-440S PC BOARD VIEW

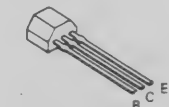
IF UNIT (X60-1300-00) Component side view



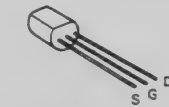
2SA562TM



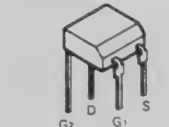
2SC2458 (Y)  
2SC2459 (Y)  
2SA1048 (Y)  
DTC114ES  
DTC143TS



2SK30A (O)



3SK73 (GR)



2SK192 (GR)

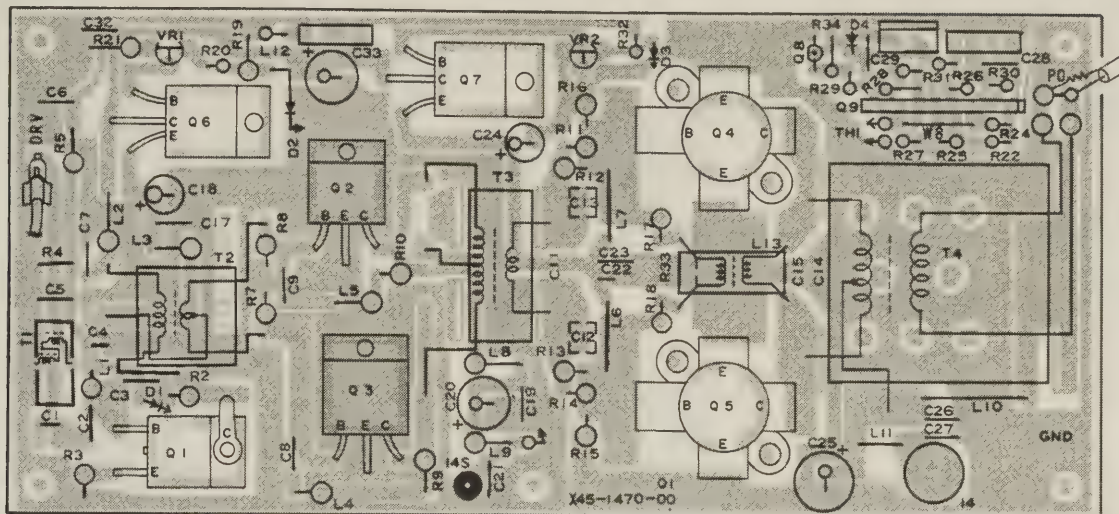


IC1: BX7191, IC2: MC3357P, IC3: M74LS123P or SN74LS123N, IC4: PC1158H2, IC5: AN612, IC7: PC2002V, IC8, 9: M74LS00P or SN74LS00N, IC10: BX6124, Q1, 2, 5, 7, 8, 46: 3SK73(GR), Q3, 9, 17, 19, 23, 24, 34, 42, 45, 53, 54: 2SC2458 (Y), Q4, 6, 11, 13, 15, 22, 28, 36, 37, 39, 41, 43, 50, 55: DTC 114ES, Q10, 12, 16, 40, 44, 52: 2SC2459 (BL), Q14, 29~32, 47, 48, 51: DTC 143TS, Q18, 21, 27, 49: 2SA1048 (Y), Q20: 2SK192 (GR), Q25, 26: 2SK30A (O), Q33, 35, 38: 2SA562TM, D1~6: 1S1007, D7, 8, 10, 12~18, 36, 50, 53, 54: 1S1587, D9, 11, 23~29, 31~34, 41, 45, 46, 48, 49, 56~59, 63, 76~80, 82~84: 1SS133, D19~22, 30, 35, 39, 42, 43: 1N60, D37, 38, 40, 65, 66, 81: 1S1555, D47: M1204, D51: MTZ9.1JB, D52: V06B, D55: MTZ6.2JA, D60, 62, 68~72, 74, 75: MC921, D61: DAN401, D67: 1SS101



# TS-440S PC BOARD/CIRCUIT DIAGRAM

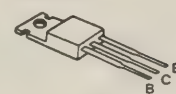
## FINAL UNIT (X45-1470-00) Component side view



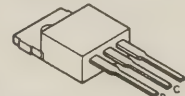
2SC1815 (Y)



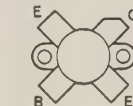
2SC2075



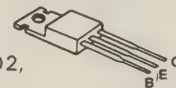
2SD1406 (Y)



2SC2879



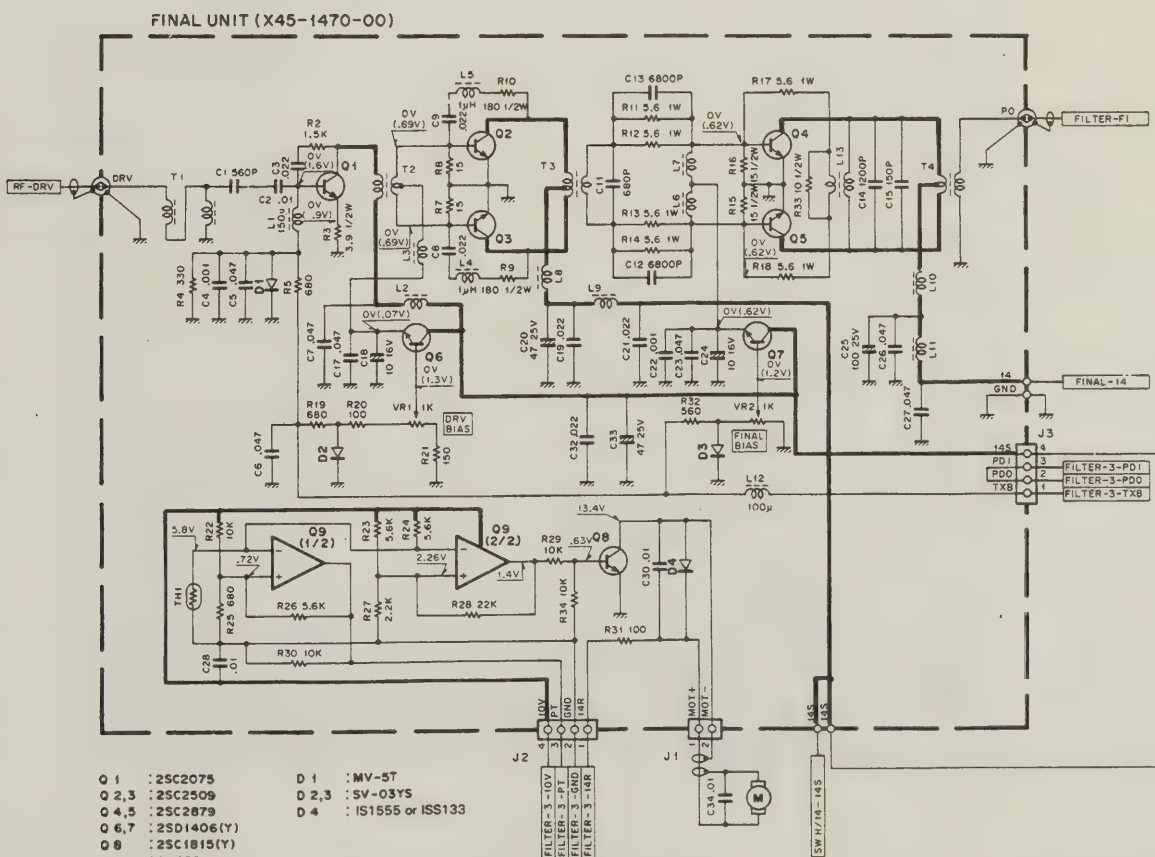
2SC2509



Q1: 2SC2075, Q2, 3: 2SC2509, Q4, 5: 2SC2879, Q6, 7: 2SD1406 (Y), Q8: 2SC1815 (Y), Q9: AN6551, D1: MV-5T, D2, 3: SV03YS, D4: 1S1533 or 1S1555.

## FINAL UNIT

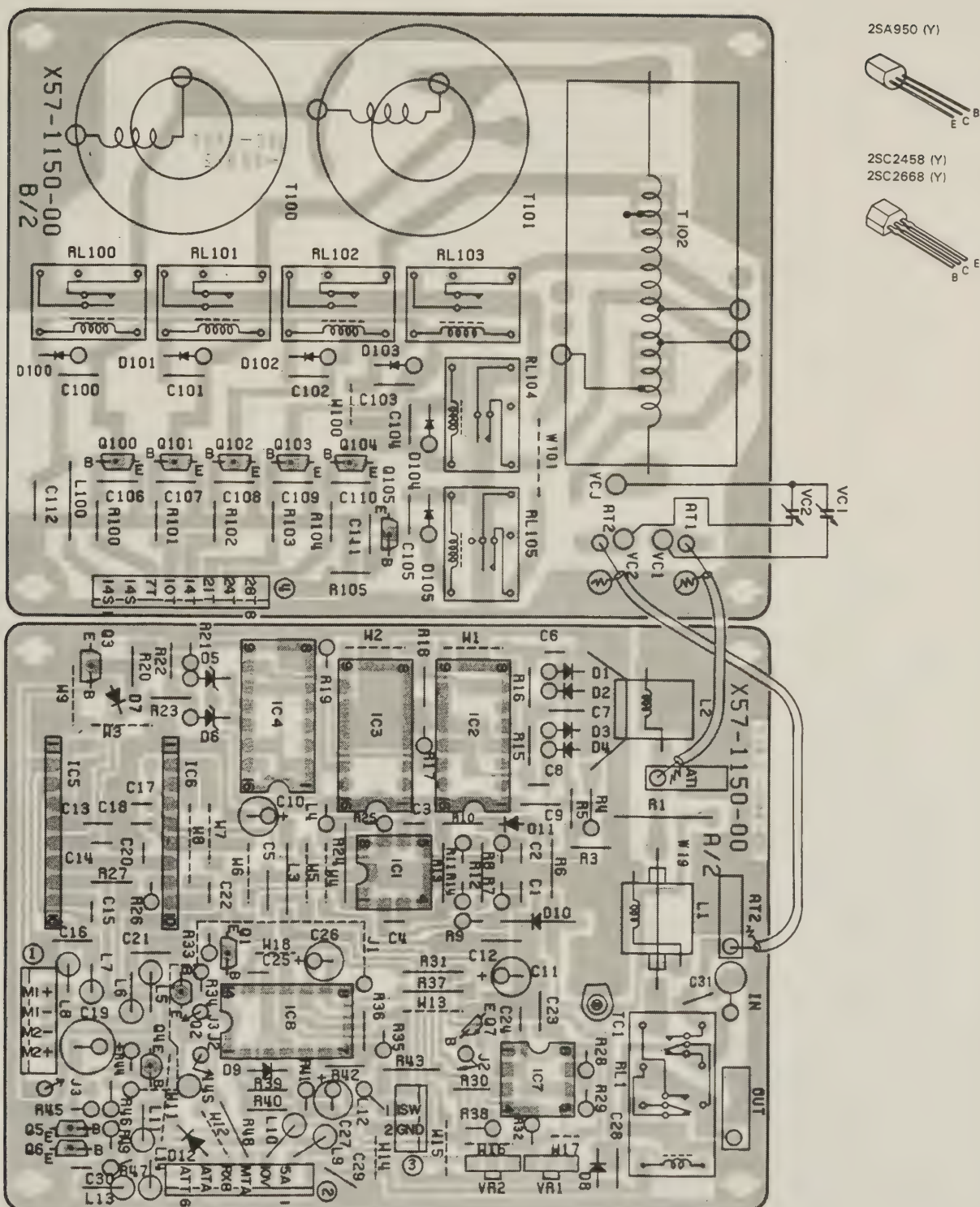
Refer to Schematic diagram on page 113.



- |        |              |        |                    |
|--------|--------------|--------|--------------------|
| Q 1    | : 2SC2075    | D 1    | : MV-5T            |
| Q 2, 3 | : 2SC2509    | D 2, 3 | : SV-03YS          |
| Q 4, 5 | : 2SC2879    | D 4    | : 1S1555 or 1S1533 |
| Q 6, 7 | : 2SD1406(Y) |        |                    |
| Q 8    | : 2SC1815(Y) |        |                    |
| Q 9    | : AN6551     |        |                    |



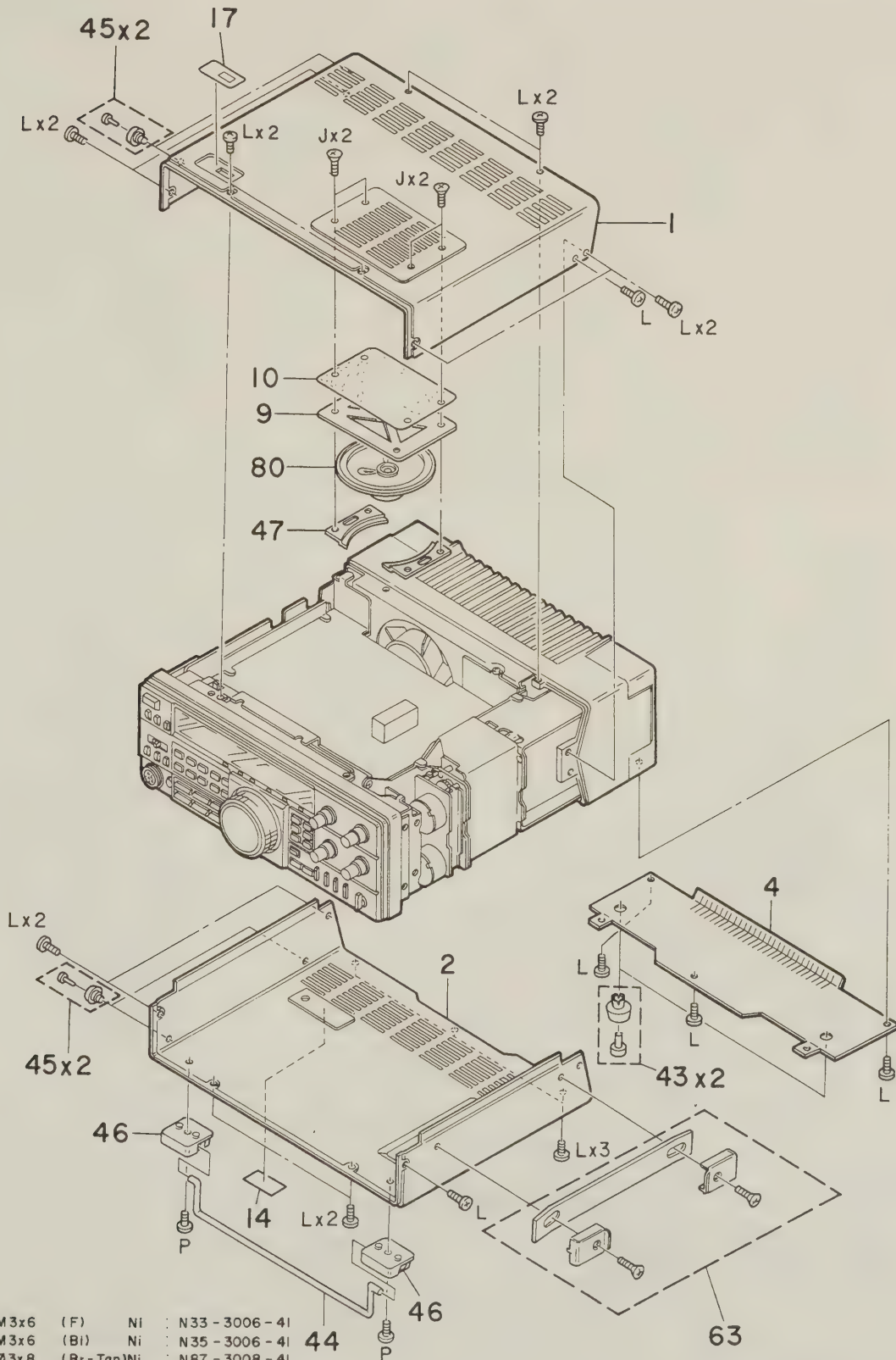
**AT UNIT (X57-1150-00) Component side view**



IC1: NJM2903D, IC2: HD10116 or MC10116L, IC3: HD10131 or MC10131L, IC4: HD10125 or MC10125L, IC5, 6: BA6109U2, IC7: NE555P, IC8: MB3614, Q1, 3, 6: DTC114ES, Q2, 4: 2SA950 (Y), Q5: 2SC2458 (Y), Q7: DTC124ES, Q100~105: 2SC2668 (Y), D1~4: 1SS99, D5, 6: UZ6.2BL, D7, 9, 12: 1SS133, D8, 100~105: 1N4448 or 1S1555, D10, 11: 1N60



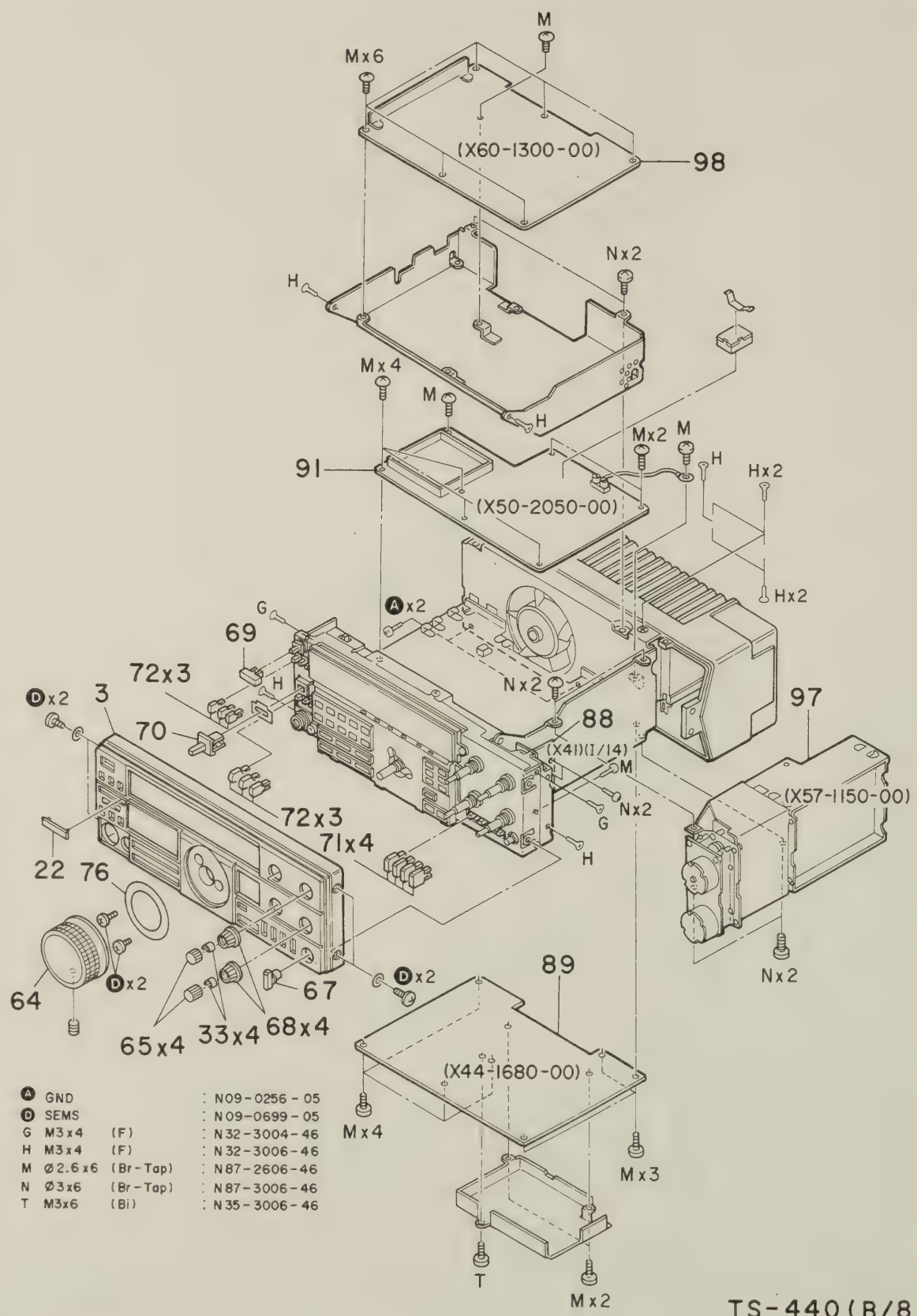
# DISASSEMBLY



|   |      |            |    |                   |
|---|------|------------|----|-------------------|
| J | M3x6 | (F)        | Ni | : N33 - 3006 - 41 |
| L | M3x6 | (Bl)       | Ni | : N35 - 3006 - 41 |
| P | Ø3x8 | (Br - Tap) | Ni | : N87 - 3008 - 41 |

TS-440(A/8)

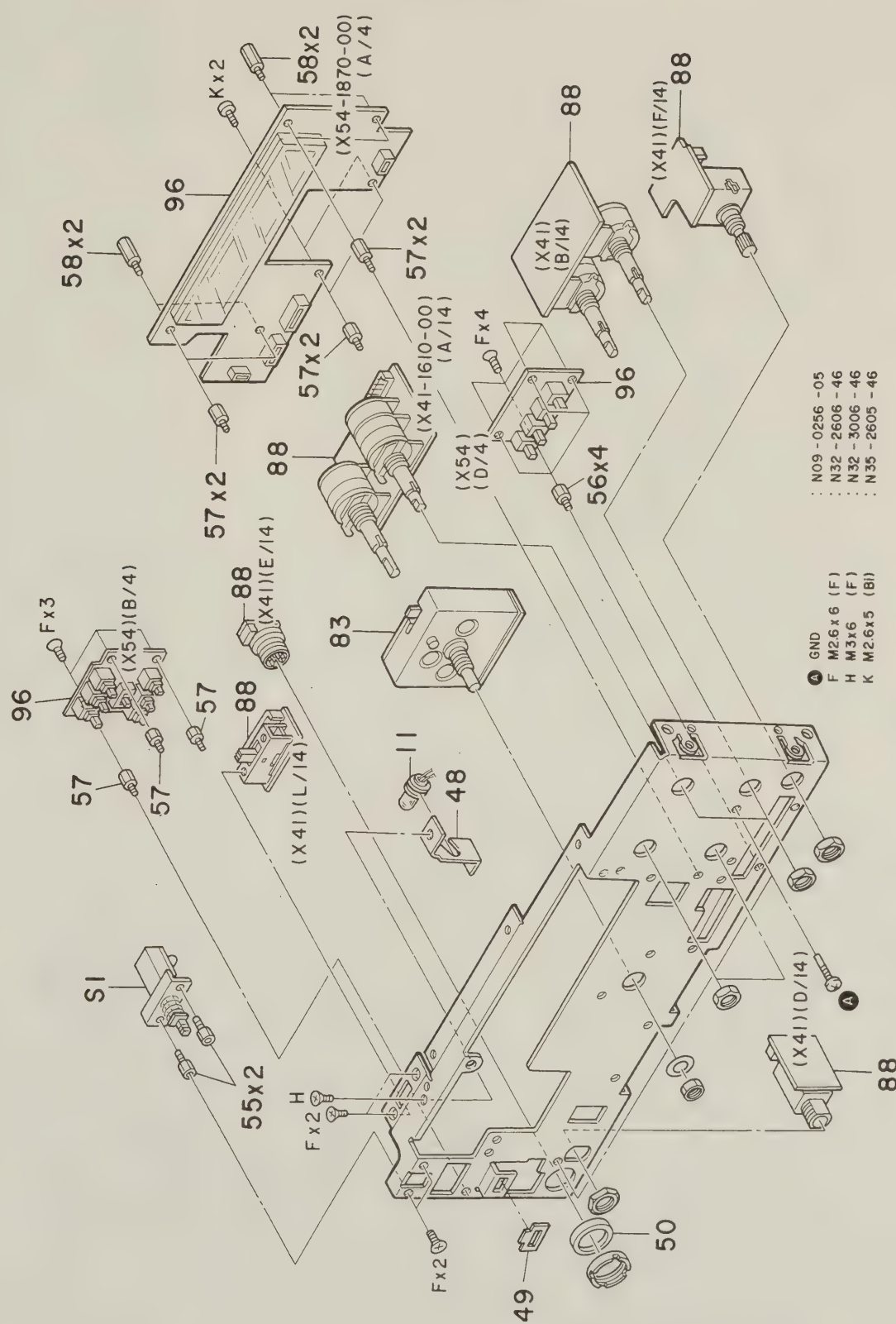
## DISASSEMBLY



TS-440 (B/8)

Parts with the exploded numbers larger than 700 are not supplied.

## DISASSEMBLY



TS-440(C/8)

: N09 - 0256 - 05  
: N32 - 2606 - 46  
: N32 - 3006 - 46  
: N35 - 2605 - 46

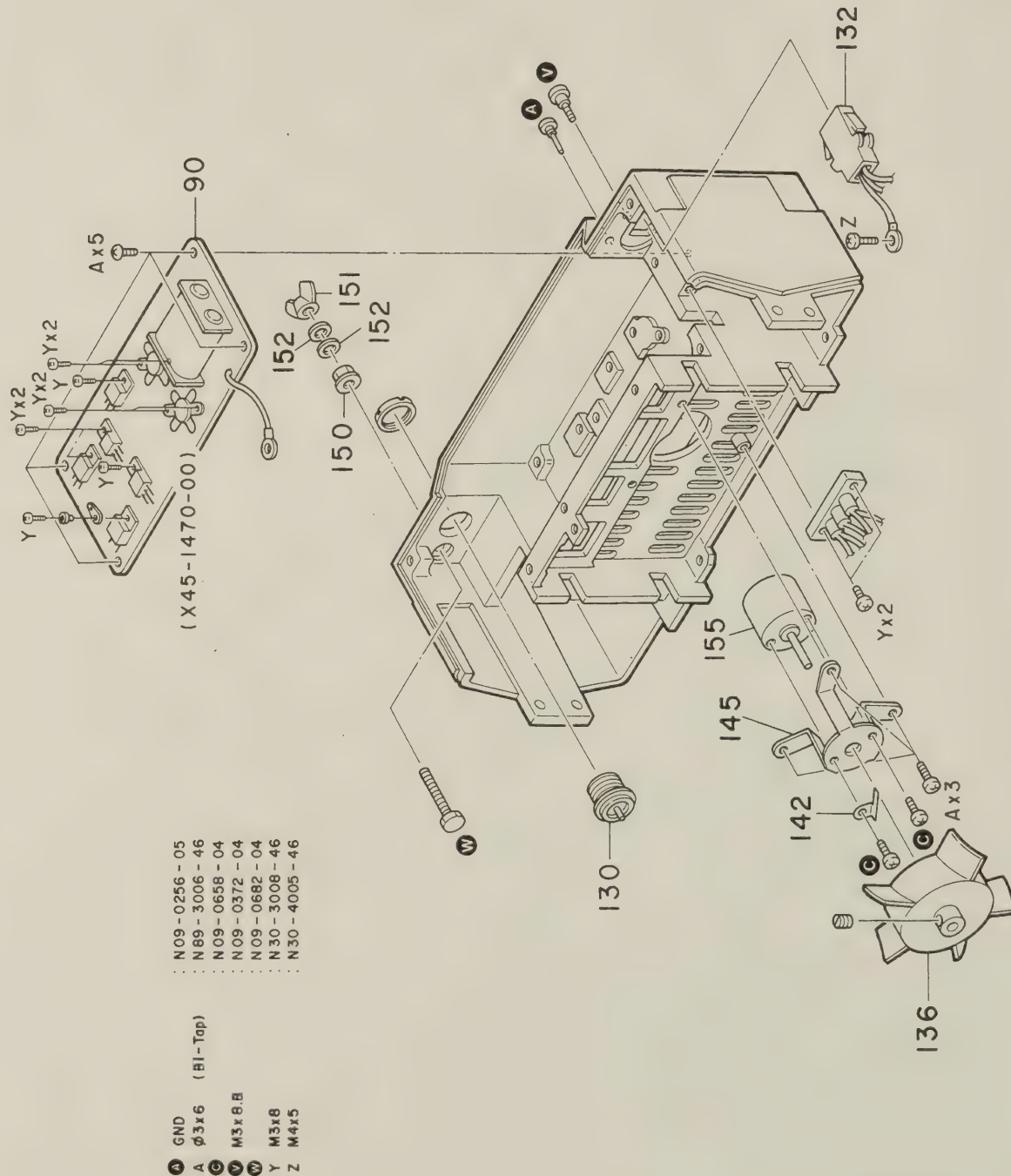
| A | GND           |
|---|---------------|
| F | M2.6 x 6 (F)  |
| H | M3 x 6 (F)    |
| K | M2.6 x 5 (Bi) |





## DISASSEMBLY

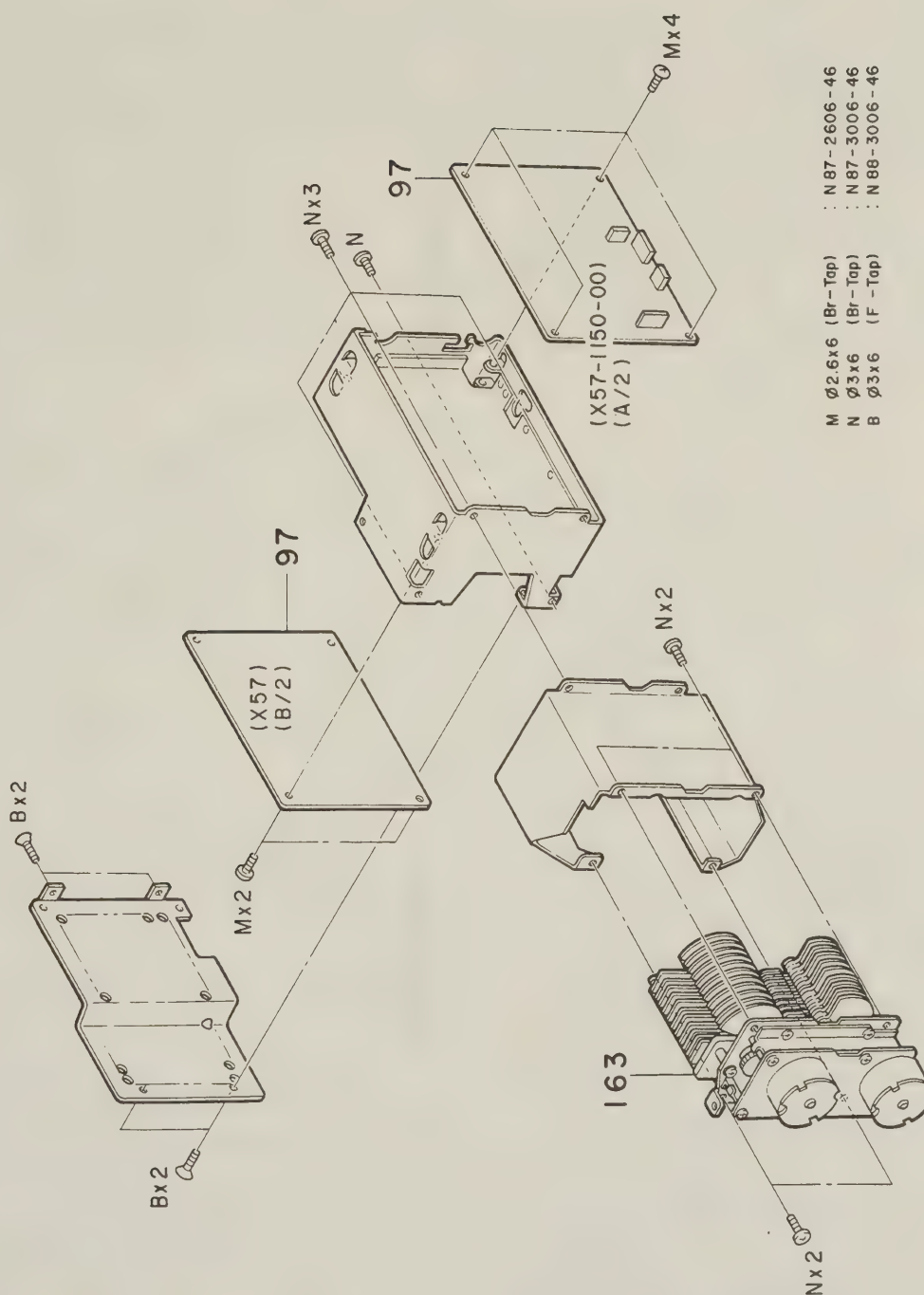
TS-440(F/8)



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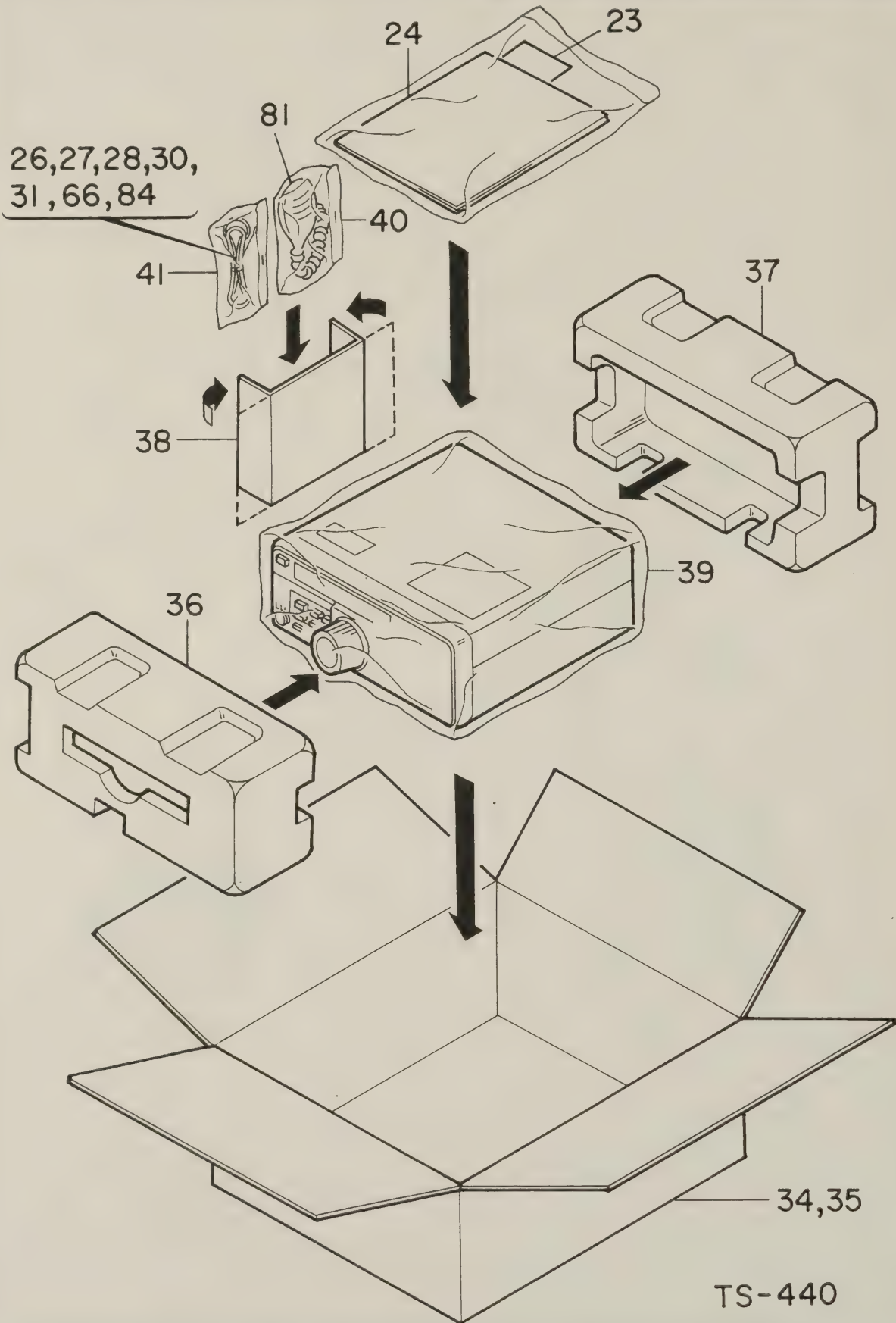
## DISASSEMBLY

TS-440(G/8)



Parts with the exploded numbers larger than 700 are not supplied.

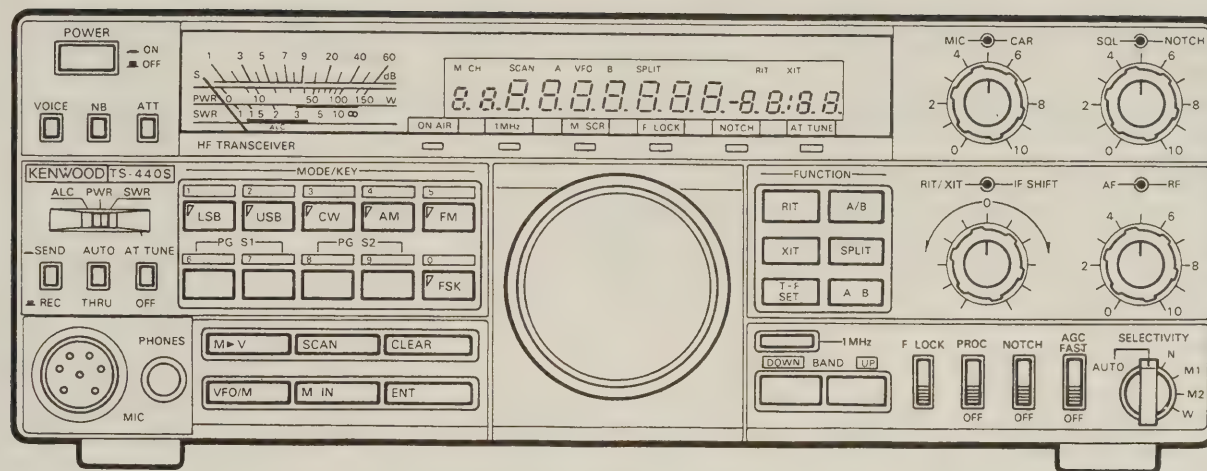
## PACKING



TS-440

Parts with the exploded numbers larger than 700 are not supplied.

## ADJUSTMENT



## PREPARATION

Unless otherwise specified, set the controls as follows.

|                  |                      |                       |                  |
|------------------|----------------------|-----------------------|------------------|
| POWER.....ON     | SELECTIVITY.....AUTO | CAR.....MIN           | ATT SW.....OFF   |
| BAND.....14      | AGC FAST.....SLOW    | IF-SHIFT.....CENTER   | SEND/REC.....REC |
| AF.....MIN       | NOTCH SW.....OFF     | FUNCTION              | AUTO.....OFF     |
| RF.....MAX       | PROC SW.....OFF      | A/B.....A             | AT TUNE.....OFF  |
| NOTCH.....CENTER | F.LOCK SW.....OFF    | RIT,XIT,SPLIT.....OFF | VOX SW.....OFF   |
| SQUELCH.....MIN  | 1MHz SW.....OFF      |                       |                  |
| MIC.....MIN      | NB SW.....OFF        |                       |                  |

## REQUIRED TEST EQUIPMENT

### 1. DC Voltmeter (DC V.M)

- 1) Input resistance: More than  $1\text{M}\Omega$
- 2) Voltage range: 1.5 to 1000V AC/DC

**NOTE:** A high-precision multimeter may be used.

However, accurate reading can not be obtained for high-impedance circuits.

## 2. DC Ammeter

- 1) Current range: 1.5A, 3A, 20A, High-precision ammeter may be used.

### 3. RF VTVM (RF V.M)

- 1) Input impedance:  $1\text{M}\Omega$  and less than  $3\text{pF}$ , min.
- 2) Voltage range:  $10\text{mV}$  to  $300\text{V}$
- 3) Frequency range:  $10\text{kHz}$  to  $100\text{MHz}$  or greater

#### 4. AF Voltmeter (AF V.M)

- 1) Frequency range: 50Hz to 10kHz
- 2) Input resistance: 1M $\Omega$  or greater
- 3) Voltage range: 10mV to 30V

### 5. AF Generator (AG)

- 1) Frequency range: 200Hz to 5kHz
- 2) Output: 1mV or less to 1V, low distortion

## 6. AF Dummy Load

- 1) Impedance:  $8\Omega$
- 2) Dissipation: 3W or greater

## 7. Oscilloscope (SCOPE)

Requires high sensitivity, and external synchronization capability.

## 8. Sweep Generator (SWEEP)

- 1) Center frequency: 50kHz to 90MHz
- 2) Frequency deviation: Maximum  $\pm 35$ MHz
- 3) Output voltage: 0.1V or greater

### 9. Standard Signal Generator (SSG)

- 1) Frequency range: 50kHz to 50MHz
  - 2) Output:  $-20\text{dB}/0.1\mu\text{V}$  to  $120\text{dB}/1\text{V}$
  - 3) Output impedance:  $50\Omega$
  - 4) AM and FM modulation can be possible.
- NOTE:** Generator must be frequency stable.

## 10. Frequency Counter (f. counter)

- 1) Minimum input voltage: 50mV
- 2) Frequency range: 50MHz or greater

## 11. Noise Generator

Must generate ignition noise containing harmonics beyond 30MHz.

## 12. RF Dummy Load

- 1) Impedance:  $150\Omega$  and  $20\Omega$
- 2) Dissipation:  $150W$  or greater

### 13. Power Meter

- 1) Impedance:  $50\Omega$
- 2) Dissipation: 150W continuous or greater
- 3) Frequency limits: 60MHz or greater

### < REFERENCE >

- | Japanese "SG" | American "SG" |
|---------------|---------------|
| - 6 dB        | 0.25 $\mu$ V  |
| 0 dB          | 0.5 $\mu$ V   |
| 6 dB          | 1 $\mu$ V     |
| 12 dB         | 2 $\mu$ V     |
| 24 dB         | 8 $\mu$ V     |
| 30 dB         | 15.8 $\mu$ V  |
| 40 dB         | 50 $\mu$ V    |
| 50 dB         | 158 $\mu$ V   |
| 60 dB         | 500 $\mu$ V   |
| 70 dB         | 1.58mV        |
| 80 dB         | 5mV           |
| 90 dB         | 15.8mV        |
| 100 dB        | 50mV          |
| 120 dB        | 0.5V          |

INPUT ○ ——— 5P ———●——— 1N60 ———●——— 100P ———○ OUTPUT  
 To PLL unit or Control unit To oscilloscope  
 GND ○ ———●——— 1N60 ———●——— GND

## 17. Power supply

## 18. Microphone

90

## ADJUSTMENT

## • VOLTAGE CHECK, ADJUSTMENT

| Item       | Condition                                                  | Measurement    |      |          | Adjustment |      |        | Specification/Remarks |
|------------|------------------------------------------------------------|----------------|------|----------|------------|------|--------|-----------------------|
|            |                                                            | Test equipment | Unit | Terminal | Unit       | Part | Method |                       |
| 1. Voltage | 1) POWER : ON<br>RF GAIN : MAX<br>MODE : USB<br>STBY : REC | DC V.M         | IF   | 19 - 5   |            |      | Check  | 13.3 ~ 14.3V          |
|            |                                                            |                |      | 19 - 9   |            |      |        | 4.5 ~ 5.5V            |
|            |                                                            |                |      | 19 - 10  |            |      |        | 7.2 ~ 8.2V            |
|            |                                                            |                |      | 9 - 1    | SW"A"      | VR-4 | 2.6V   | + 0.05V, - 0V         |
|            |                                                            |                |      | 27 - 4   | IF         | VR-5 | 8.8V   |                       |

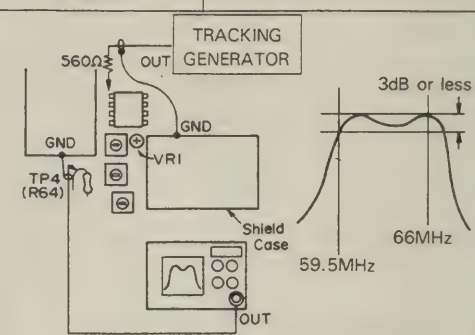
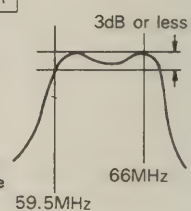
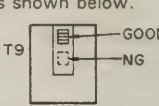
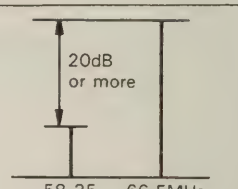
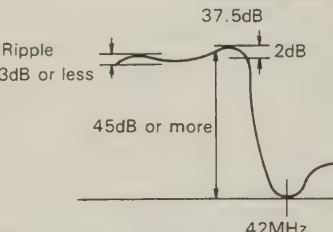
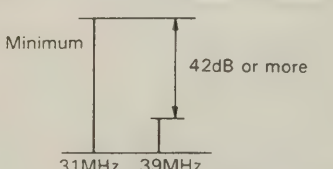
## • COMMON ADJUSTMENT

| Item   | Condition  | Measurement    |      |          | Adjustment |      |           | Specification/Remarks |
|--------|------------|----------------|------|----------|------------|------|-----------|-----------------------|
|        |            | Test equipment | Unit | Terminal | Unit       | Part | Method    |                       |
| 1. CAR | MODE : USB | Oscilloscope   | IF   | 14 - 2   | IF         | L15  | 0.4V/p-p  | ± 0.05V/p-p           |
|        |            | Freq. counter  |      |          |            | TC2  | 8.3750MHz | ± 50Hz                |

## • PLL ADJUSTMENT

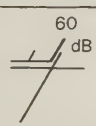
| Item                              | Condition                                                                           | Measurement    |      |             | Adjustment |        |                   | Specification/Remarks       |
|-----------------------------------|-------------------------------------------------------------------------------------|----------------|------|-------------|------------|--------|-------------------|-----------------------------|
|                                   |                                                                                     | Test equipment | Unit | Terminal    | Unit       | Part   | Method            |                             |
| 1. Reference oscillator frequency | 36MHz                                                                               | Freq. counter  | PLL  | TP6 (R96)   | PLL        | TC1    | 36.000,000MHz     | ± 10Hz                      |
| 2. RIT                            | 1) FREQ : 14.0000MHz<br>MODE : AM<br>RIT Pot : CENTER<br>RIT SW : ON                | DISPLAY        |      |             | SW"A"      | VR3    | 14.000,00 RIT.0.0 |                             |
|                                   | 2) RIT Pot. : FULL CW (+)                                                           |                |      |             |            |        |                   | 14.00120 RIT1.2 or more     |
|                                   | RIT Pot. : FULL CCW -)                                                              |                |      |             |            |        |                   | 13.998.80 RIT - 1.2 or more |
| 3. VCO5                           |                                                                                     | DC V.M         | PLL  | TR11 (R146) | PLL        | T20    | 5.0V              | ± 0.2V                      |
| 4. VCO4                           | 1) FREQ : 14.0000MHz<br>MODE : AM<br>Disconnect PLL- 6 connector when PLL unlocked. | DC V.M         | PLL  | TP1 (L2)    | PLL        | T1     | 3.8V              | ± 0.1V                      |
|                                   | 2) MODE : USB                                                                       |                |      |             |            |        |                   |                             |
|                                   | 3) MODE : LSB                                                                       |                |      |             |            |        |                   |                             |
|                                   | 4) MODE : USB<br>IF SHIFT Pot. : CENTER                                             | Freq. counter  | PLL  | 3 - 2       | SW"A"      | VR7    | 456.875kHz        | ± 1                         |
|                                   | 5) IF SHIFT Pot. : FULL CW                                                          |                |      |             |            |        |                   |                             |
|                                   | 6) IF SHIFT Pot. : FULL CCW                                                         |                |      |             |            |        |                   |                             |
|                                   | 7) IF SHIFT Pot. : CENTER                                                           |                |      |             |            |        |                   |                             |
| 5. VCO3                           | 1) FREQ : 13.9999MHz<br>MODE : AM                                                   | DC V.M         | PLL  | TP2 (L13)   | PLL        | T2     | 6.2V              | ± 0.1V                      |
|                                   | 2) FREQ : 14.0000MHz<br>MODE : AM                                                   |                |      |             |            |        |                   |                             |
| 6. PLL 6.6MHz BPF                 | 1) FREQ : 14.0050MHz<br>MODE : AM                                                   | Oscilloscope   | PLL  | TP3 (R60)   | PLL        | T3 - 5 | MAX               | Ref. 0.2V/p-p               |

## ADJUSTMENT

| Item                              | Condition                                                                                                                 | Measurement                |      |                  | Adjustment |                  |                                                                                              | Specification/Remarks                                                                                                                             |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------|----------------------------|------|------------------|------------|------------------|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
|                                   |                                                                                                                           | Test equipment             | Unit | Terminal         | Unit       | Part             | Method                                                                                       |                                                                                                                                                   |
| 7. PLL<br>62MHz BPF               | 1) MODE : AM<br>Readjust T9 (VCO2 OSC coil) to unlock. (Core is fully bottom position)                                    | Tracking Gen.              | PLL  | IC8-1 (1 pin)    |            |                  |           |                                                                |
|                                   | 2) Connect 560Ω resistor in Tracking Gen. output line. Use oscilloscope's probe to connect to spectrum analyzer.          | Spectrum analyzer Probe    |      | TP4 (R64)        |            | T6,7,8           |                                                                                              |                                                                                                                                                   |
| 8. VCO2                           | 1) Reset operation must also be performed.<br>*See a microprocessor operation check.<br>1) FREQ : 14.0000MHz<br>MODE : AM | DC V.M                     | PLL  | TP5 (L21)        | PLL        | T9               | 6.4V                                                                                         | T9 has two peaking point. Adjust as shown below.<br>± 0.1V<br> |
|                                   | 2) FREQ : 13.999,9 : MHz<br>MODE : AM                                                                                     |                            |      |                  |            |                  |                                                                                              | 2.2 ~ 3.0V                                                                                                                                        |
|                                   | 3) FREQ : 14.000,00 MHz<br>MODE : AM                                                                                      | Spectrum analyzer          | PLL  | TP4 (R64)        | PLL        | VR1              | L23 and L21 shorted to ground. (PLL unlocked)<br>Adjust spurious radiation level. (58.25MHz) |                                                               |
|                                   |                                                                                                                           |                            |      |                  |            |                  |                                                                                              |                                                                                                                                                   |
| 9. PLL 30MHz BPF                  | FREQ : 14.250.00MHz<br>MODE : AM                                                                                          | Oscilloscope               | PLL  | TP7<br>IC12-5pin | PLL        | T10,11<br>,12    | MAX                                                                                          | Ref. 0.3V/p-p                                                                                                                                     |
| 10. PLL 38.5~39MHz BPF            | FREQ : 14.250.00MHz<br>MODE : AM                                                                                          | Oscilloscope               | PLL  | TP8<br>(R112)    | PLL        | T13,14<br>,15    | MAX                                                                                          | Ref. 0.2V/p-p                                                                                                                                     |
| 11. PLL VCO<br>(6.5~36MHz)<br>BPF | 1) Disconnect RF unit coax. cable (VCO)                                                                                   | Tracking Generator         | PLL  | IC14-1pin        |            |                  |                                                                                              |                                                                                                                                                   |
|                                   | 2) Connect 560Ω resistor in Tracking Generator output line. Use oscilloscope's probe to connect to spectrum analyzer.     | Probe<br>Spectrum analyzer |      | TP9 (L33)        | PLL        | T16,17<br>,18,19 |         | Less than 2dB between peak and point of 37.5MHz.                                                                                                  |
| 12. 39MHz Spurious radiation      | FREQ : 24.9500MHz<br>MODE : AM                                                                                            | Spectrum analyzer          | PLL  | TP9 (L33)        | PLL        | VR2              |         |                                                                                                                                                   |
| 13. VCO1                          | 1) FREQ : 29.9999MHz<br>MODE : AM                                                                                         | DC V.M                     | PLL  | TP10 (R138)      | RF         | T21              |                                                                                              | ± 0.1V                                                                                                                                            |
|                                   | FREQ : 22.0000MHz                                                                                                         |                            |      |                  |            |                  |                                                                                              | 5.3 ~ 6.3V                                                                                                                                        |
|                                   | 2) FREQ : 21.9999MHz                                                                                                      |                            |      |                  |            | T22              | 2.5V                                                                                         | ± 0.1V                                                                                                                                            |
|                                   | FREQ : 14.5000MHz                                                                                                         |                            |      |                  |            |                  |                                                                                              | 5.3 ~ 6.3V                                                                                                                                        |
|                                   | 3) FREQ : 14.9999MHz                                                                                                      |                            |      |                  |            | T23              |                                                                                              | ± 0.1V                                                                                                                                            |
|                                   | FREQ : 7.5000MHz                                                                                                          |                            |      |                  |            |                  |                                                                                              | 5.3 ~ 6.3V                                                                                                                                        |
|                                   | 4) FREQ : 7.4999MHz                                                                                                       |                            |      |                  |            | T24              |                                                                                              | ± 0.1V                                                                                                                                            |
|                                   | FREQ : 30.0 (30kHz)                                                                                                       |                            |      |                  |            |                  |                                                                                              | 5.5 ~ 6.5V                                                                                                                                        |

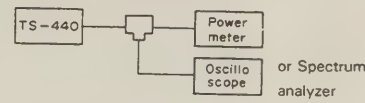
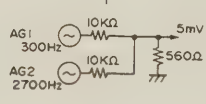
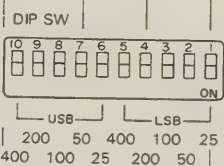
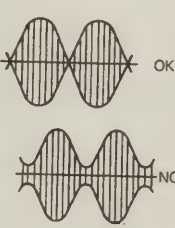
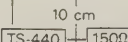
## ADJUSTMENT

## • RX ADJUSTMENT

| Item                  | Condition                                                                                                                                        | Measurement                                         |            |                          | Adjustment           |                                          |                                                                       | Specification/Remarks                                                                             |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|------------|--------------------------|----------------------|------------------------------------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
|                       |                                                                                                                                                  | Test equipment                                      | Unit       | Terminal                 | Unit                 | Part                                     | Method                                                                |                                                                                                   |
| 1. IF AMP (common)    | FREQ : 14.1750MHz<br>MODE : USB<br>RF GAIN Control : MAX<br>Use the minimum SSG input possible during alignment.                                 | SSG<br>AF V.M<br>Oscilloscope<br>AF dummy-load (8Ω) | Rear Panel | ANT<br>EXT.SP            | RF                   | T4,5,3<br><br>T7,8,15<br>9, 12,<br>10,11 | MAX<br><br>Repeat 2~3 times in case of T4,5,3,12, 10,11               | S/N 10 dB or more at -6dB input. 1V or more/8Ω at AF GAIN control MAX.                            |
| 2. 2nd MIX balance    | FREQ : 14.1750MHz<br>MODE : USB<br>Connect the SSG to ANT terminal.                                                                              | SSG<br>AF V.M<br>Oscilloscope                       |            |                          | RF                   | VR2                                      | MAX AF Noise level.                                                   |                                                                                                   |
| 3. 1st MIX balance    | FREQ : 100.0 (100kHz)<br>MODE : USB                                                                                                              |                                                     |            |                          | RF                   | VR1                                      | MIN AF noise level.                                                   |                                                                                                   |
| 4. IF TRAP            | FREQ : 29MHz Band<br>SSG : 45.05MHz<br>OUT : 80 dBμ                                                                                              |                                                     |            |                          | RF                   | T1<br>TC1                                | Internal spurious beat MIN.                                           | Repeat 2~3 times 70dB or more                                                                     |
| 5. RX DET Balance     | 1) FREQ : 14.1750 MHz<br>MODE : USB<br>RF GAIN : MIN<br>IF SHIFT : CENTER<br>RF GAIN : MAX after adjustment                                      | RF V.M<br>or<br>Oscilloscope                        | IF         | Q9<br>(emitter)<br>(R77) | IF                   | TC1                                      | MIN                                                                   |                                                                                                   |
| 6. IF AMP (SSB)       | FREQ : 14.1750MHz<br>SSG : 14.1760 MHz<br>OUT : 0 dBμ<br>MODE : USB                                                                              | SSG<br>AF V.M<br>Oscilloscope                       | Rear panel |                          | IF                   | L1,2,3<br>4,18,5                         | MAX AF output<br>Use the minimum SSG input possible during alignment. |                                                                                                   |
| 7. IF AMP (FM)        | FREQ : 14.1750MHz<br>SSG : 14.1750 MHz<br>MOD : 1kHz, DEV: 3kHz<br>OUTPUT : 30dBμ<br>MODE : FM                                                   |                                                     |            |                          | IF                   | L6                                       | MAX AF output                                                         |                                                                                                   |
| 8. S-METER (FM)       | FREQ : 29.0000MHz<br>MODE : FM<br>SSG : MOD OFF<br>OUTPUT : 30dBμ                                                                                |                                                     |            | ANT                      | IF                   | VR3                                      | Full scale                                                            |  30dB ± 10dB |
| 9. S-METER (SSB)      | 1) No signal<br>(SSG output: OFF)                                                                                                                | S-meter                                             |            |                          | IF                   | VR2                                      | Set to starting point.<br>(Meter zero)                                |                                                                                                   |
|                       | 2) FREQ : 14.1750 MHz<br>MODE : USB<br>SSG output : 8dBμ                                                                                         | SSG<br>S-meter                                      | Rear panel | ANT                      | IF                   | L3                                       | S1<br>Adjust counter clockwise from peak.<br>(turn slug out)          |                                                                                                   |
|                       | 3) SSG output : 40dBμ                                                                                                                            |                                                     |            |                          |                      | VR3                                      | S9                                                                    | 40dB ± 6dB                                                                                        |
| 10. Squelch threshold | 1) MODE : CW<br>SELECTIVITY : WIDE<br>SQL control : 12 o'clock                                                                                   | Speaker                                             |            | EXT.<br>SP               | IF                   | VR4                                      | Adjust VR slowly and stop at threshold.                               | 12 o'clock                                                                                        |
| 11. Noise Blanker     | 1) FREQ : 14.1750 MHz<br>NB SW : ON<br>SSG output : 14.175MHz<br>First adjust 20dB input, then use the minimum input as possible.                | SSG<br>DC V.M<br>Oscilloscope                       | Rear panel | ANT<br>EXT<br>SP         | RF<br>R146<br>(10kΩ) | T26<br>27                                | MIN                                                                   |                                                                                                   |
|                       | 2) Noise Gen. : Low level                                                                                                                        | Noise Gen.<br>SP                                    |            |                          |                      | T26<br>27                                | MIN noise level                                                       |                                                                                                   |
| 12. Beeper            | 1) AF GAIN Control : 12 o'clock<br>Depressing [A=B] and [AM] key at the same time<br>2) POWER SW : ON<br>3) Set to MEMORY CH17 when turning VFO. | AF V.M<br>Oscilloscope<br>AF dummy load             |            | EXT.<br>SP               | IF                   | VR10                                     | 120mV/8Ω                                                              | ± 10mV                                                                                            |



## ADJUSTMENT

| Item                                                                                                         | Condition                                                                                                                                                                                                                | Measurement                                         |            |                           | Adjustment |              |                                                                                     | Specification/Remarks                                                                                                             |
|--------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|------------|---------------------------|------------|--------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                              |                                                                                                                                                                                                                          | Test equipment                                      | Unit       | Terminal                  | Unit       | Part         | Method                                                                              |                                                                                                                                   |
| 8. Carrier suppression                                                                                       | FREQ: 14.1750 MHz<br>MODES: USB and LSB<br>MIC LEVEL control: MIN<br>STBY: SEND                                                                                                                                          | Power meter<br>Oscilloscope<br>or Spectrum analyzer | Rear Panel | ANT (Directional coupler) | IF         | VR 7,8       | MIN                                                                                 | - 40 dB or less<br><br>Directional coupler<br> |
| VR1 +<br>VR2<br>adjustment                                                                                   | 50 MHz and LSB<br>two tones 5 mV .<br>00, 2700 Hz<br>50 W using MIC                                                                                                                                                      | Oscilloscope                                        | Rear panel | ANT (Directional coupler) | Cont.      | S50 (DIP SW) | Adjust as shown below.                                                              | *If this adjustment is performed, step 8 must also be performed.                                                                  |
|                                                                                                              | <br><br>DIP SW are adjustable from - 400 to + 375 Hz. |                                                     |            |                           |            |              |  |                                                                                                                                   |
| no tone generator is not available, adjust for equal output power at 300, 2700 Hz, as measured on wattmeter. |                                                                                                                                                                                                                          |                                                     |            |                           |            |              |                                                                                     |                                                                                                                                   |
| processor                                                                                                    | MODE: USB<br><br>AG output: 1 kHz, 10 mV<br>Set output to 50 W using MIC<br>LEVEL control<br>PROC SW: ON and OFF<br>STBY: SEND                                                                                           | Power meter<br>AG<br>AF V. M.                       | Rear panel | ANT                       | IF         | VR6          | Level should be the same between ON and OFF                                         |                                                                                                                                   |
|                                                                                                              | 2) AG output: 1 kHz, 1 mV<br>(20 dB down)<br>STBY: SEND                                                                                                                                                                  |                                                     |            |                           |            |              |                                                                                     | 25W or more                                                                                                                       |
| 11. FM. DEV.                                                                                                 | 1) FREQ: 28.7000 MHz<br>MODE: FM<br>AG output: 1 kHz, 30 mV<br>50 mV (K)                                                                                                                                                 | Power meter<br>Linear detector<br>AG<br>AF V. M.    | Rear panel | ANT (Directional coupler) | RF         | VR6          | 4.6 kHz                                                                             | ± 0.1 kHz                                                                                                                         |
|                                                                                                              | 2) AG output: 1 kHz, 3 mV<br>5 mV (K)                                                                                                                                                                                    |                                                     |            |                           | RF         | VR3          | 3 kHz                                                                               | ± 0.1 kHz                                                                                                                         |
| 12. CW Side tone                                                                                             | MODE: CW<br>CW BREAK IN SW: SEMI<br>AF GAIN control: 12 o'clock<br>VOX GAIN control: MIN<br>STBY: REC<br>Connect KEY to KEY jack and close the key contacts.                                                             | Power meter<br>AF V.M<br>Oscilloscope               |            | EXT. SP                   | IF         | VR9          | 0.63V/8Ω                                                                            |                                                                                                                                   |
| 13. Auto antenna tuner<br>(If AT-440 is installed)                                                           | 1) BAND: 28.5000 MHz<br>MODE: CW<br>CAR LEVEL control: MAX<br>AT unit VR1: 12 o'clock<br>VR2: Fully CCW<br>AUTO-THRU SW: AUTO<br>AT-TUNE SW : ON                                                                         | 150Ω RF dummy load                                  |            |                           | AT         | TC1          | Minimum SWR meter reading                                                           | Repeat 2-3 times.                                                                                                                 |
|                          |                                                                                                                                                                                                                          |                                                     |            |                           |            |              |                                                                                     |                                                                                                                                   |



VR 1 +

VR 2

asympt

# **John's Lawn Service**

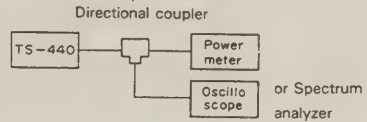
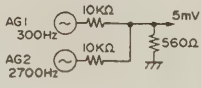
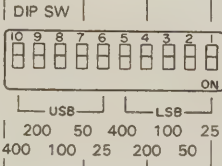
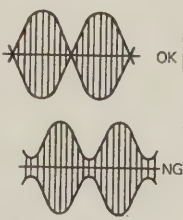
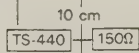
**Free Estimates - Reasonable Rates**

**Also Junk and Trash Removal - Light Hauling**

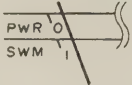
**John Travis**

**(828 299-1085)**

## ADJUSTMENT

| Item                                                                                                             | Condition                                                                                                                                                    | Measurement                                                                                           |            |                                                                                                                                  | Adjustment |                 |                                                                                                                   | Specification/Remarks                                            |
|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------|------------|-----------------|-------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
|                                                                                                                  |                                                                                                                                                              | Test equipment                                                                                        | Unit       | Terminal                                                                                                                         | Unit       | Part            | Method                                                                                                            |                                                                  |
| 8. Carrier suppression                                                                                           | FREQ: 14.1750 MHz<br>MODES: USB and LSB<br>MIC LEVEL control: MIN<br>STBY: SEND                                                                              | Power meter<br>Oscilloscope<br>or Spectrum analyzer                                                   | Rear Panel | ANT<br>(Directional coupler)                                                                                                     | IF         | VR 7,8          | MIN<br><br>                    | - 40 dB or less                                                  |
| 9. SSB made frequency response                                                                                   | FREQ: 14.1750 MHz<br>MODES: USB and LSB<br>AG output: Two tones 5 mV .<br>300, 2700 Hz<br>Set output to 50 W using MIC LEVEL control.<br>STBY: SEND          | Oscilloscope<br><br> | Rear panel | ANT<br>(Directional coupler)<br><br>DIP SW<br> | Cont.      | S50<br>(DIP SW) | Adjust as shown below.<br>     | *If this adjustment is performed, step 8 must also be performed. |
| If two tone generator is not available, adjust for equal output power at 300, 2700 Hz, as measured on wattmeter. |                                                                                                                                                              |                                                                                                       |            |                                                                                                                                  |            |                 |                                                                                                                   |                                                                  |
| 10. Speech processor                                                                                             | 1) FREQ: 14.2000 MHz<br>MODE: USB<br><br>AG output: 1 kHz, 10 mV<br>Set output to 50 W using MIC LEVEL control<br>PROC SW: ON and OFF<br>STBY: SEND          | Power meter<br>AG<br>AF V. M.                                                                         | Rear panel | ANT                                                                                                                              | IF         | VR6             | Level should be the same between ON and OFF                                                                       |                                                                  |
|                                                                                                                  | 2) AG output: 1 kHz, 1 mV<br>(20 dB down)<br>STBY: SEND                                                                                                      |                                                                                                       |            |                                                                                                                                  |            |                 |                                                                                                                   | 25W or more                                                      |
| 11. FM. DEV.                                                                                                     | 1) FREQ: 28.7000 MHz<br>MODE: FM<br>AG output: 1 kHz, 30 mV<br>50 mV (K)                                                                                     | Power meter<br>Linear detector<br>AG<br>AF V. M.                                                      | Rear panel | ANT<br>(Directional coupler)                                                                                                     | RF         | VR6             | 4.6 kHz                                                                                                           | ±0.1 kHz                                                         |
|                                                                                                                  | 2) AG output: 1 kHz, 3 mV<br>5 mV (K)                                                                                                                        |                                                                                                       |            |                                                                                                                                  | RF         | VR3             | 3 kHz                                                                                                             | ±0.1 kHz                                                         |
| 12. CW Side tone                                                                                                 | MODE: CW<br>CW BREAK IN SW: SEMI<br>AF GAIN control: 12 o'clock<br>VOX GAIN control: MIN<br>STBY: REC<br>Connect KEY to KEY jack and close the key contacts. | Power meter<br>AF V.M<br>Oscilloscope                                                                 |            | EXT.<br>SP                                                                                                                       | IF         | VR9             | 0.63V/8Ω                                                                                                          |                                                                  |
| 13. Auto antenna tuner<br>(If AT-440 is installed)                                                               | 1) BAND: 28.5000 MHz<br>MODE: CW<br>CAR LEVEL control: MAX<br>AT unit VR1: 12 o'clock<br>VR2: Fully CCW<br>AUTO-THRU SW: AUTO<br>AT-TUNE SW : ON             | 150Ω RF dummy load                                                                                    |            |                                                                                                                                  | AT         | TC1             | Minimum SWR meter reading<br> | Repeat 2~3 times.                                                |

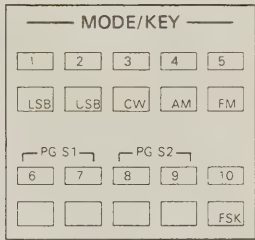
ADJUSTMENT

| Item | Condition                                                                                                                     | Measurement         |      |                                                                                   | Adjustment |      |                                                   | Specification/Remarks |
|------|-------------------------------------------------------------------------------------------------------------------------------|---------------------|------|-----------------------------------------------------------------------------------|------------|------|---------------------------------------------------|-----------------------|
|      |                                                                                                                               | Test equipment      | Unit | Terminal                                                                          | Unit       | Part | Method                                            |                       |
|      | 2) AT-TUNE SW: OFF<br>Disconnect No.① connector from AT unit.<br>STBY: SEND<br>Set. SWR 1.25 reading when VFO dial is turned. | Set as shown right. |      |  |            |      |                                                   |                       |
|      | 3) STBY: REC<br>AT TUNE: ON                                                                                                   |                     |      |                                                                                   |            |      |                                                   |                       |
|      | 4) AF TUNE: OFF<br>Reconnect No.① connector after adjustment.                                                                 |                     |      |                                                                                   |            |      |                                                   |                       |
|      |                                                                                                                               |                     |      |                                                                                   | AT         | VR2  | Adjust VR2 until AT TUNE indicator just goes off. |                       |

## ADJUSTMENT

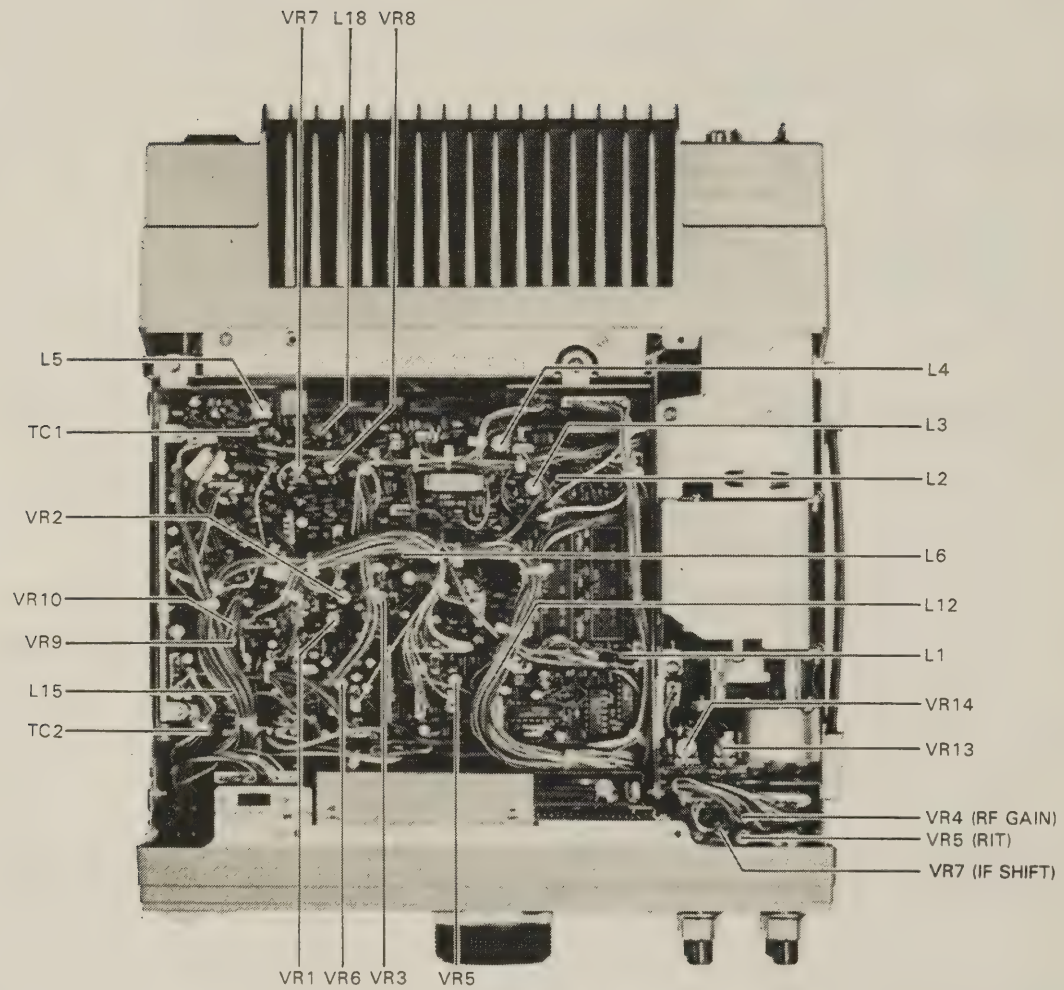
## MICROPROCESSOR OPERATION CHECK

| Item           | Condition                                                                                                                       | Operation check                                                                                                                                                                                                                                                                                                         |
|----------------|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Reset check | 1) FUNCTION SW: A<br>POWER SW: OFF<br>Set the POWER SW ON while depressing the <b>A=B</b> key. Then release the <b>A=B</b> key. | FREQ: 14,000.0kHz<br>MODE: USB<br>VFO A: Lights<br>The "Beeper" sound simultaneously with POWER ON.                                                                                                                                                                                                                     |
|                | 2) FUNCTION SW: B                                                                                                               | FREQ: 14,000.0kHz<br>MODE: USB<br>VFO B: Lights                                                                                                                                                                                                                                                                         |
|                | 3) <b>VFO/M</b> SW: ON<br>M.CH SW: Change the channels in 00 through 99 order.                                                  | The frequency display disappears. M.CH display lights and displays 00—99 order. Split display lights when turning VFO dial 90—99.                                                                                                                                                                                       |
| 2. Band        | 1) <b>VFO/M</b> SW: OFF<br>1MHz STEP SW: OFF<br>Depress the "BAND : UP" key once.<br>Press repeatedly.                          | FREQ : <b>1</b> <b>8</b> , <b>0</b> 00.0kHz<br>The "Beeper" sounds simultaneously.<br><br>The MHz display <input type="checkbox"/> <input type="checkbox"/> , <input type="checkbox"/> counts up. The "Beeper" sounds simultaneously.                                                                                   |
|                | 2) Hold the "BAND : UP" on.                                                                                                     | FREQ:<br><div style="display: flex; justify-content: space-between;"> <div> 14,000.0<br/>↑<br/>10,000.0<br/>↑<br/>7,000.0<br/>↑<br/>3,500.0<br/>↑<br/>1,500.0 </div> <div> 18,000.0<br/>↓<br/>21,000.0<br/>↓<br/>24,500.0<br/>↓<br/>28,500.0<br/>↓<br/>29,500.0 </div> </div><br>The "Beeper" sounds at each Key-press. |
|                | 3) Depress the "BAND: DOWN" key once.                                                                                           | FREQ: <input type="checkbox"/> <input type="checkbox"/> , <input type="checkbox"/> 00.0kHz<br>Displays 1MHz lower frequency than that previously displayed in 2).<br>The "Beeper" sounds.                                                                                                                               |
|                | Repeat the operation.                                                                                                           | The frequency display steps down 1MHz at each key-press.<br>The "Beeper" sounds.                                                                                                                                                                                                                                        |
|                | 4) Hold the "BAND: DOWN" key on.                                                                                                | The frequency display in 2) steps down. The "Beeper" sounds at each key-press.                                                                                                                                                                                                                                          |
|                | 5) 1MHz STEP SW: ON<br>Hold the "UP" key on.                                                                                    | 1MHz LED (green) lights.<br>FREQ: <input type="checkbox"/> <input type="checkbox"/> ,000.0kHz<br>The MHz display <input type="checkbox"/> <input type="checkbox"/> advances 1MHz at each key-press.                                                                                                                     |
|                | Hold the "DOWN" key on.                                                                                                         | The display steps down 1MHz at each key-press.                                                                                                                                                                                                                                                                          |

| Item                                                                 | Condition                                                                                                                                                                                                         | Operation check                                                                                                                                                                                          |
|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3. Dial                                                              | 1) FREQ: 0,000.0kHz<br>① Check to see if the display does not change by turning the VFO control counterclockwise. And adjust the index by turning it in the same way.<br>② Turn the VFO control slowly clockwise. |                                                                                                                                                                                                          |
| 4. MODE function (LSB, USB, CW, AF, FM, FSK)                         | Change MODE (ex: depress CW once)                                                                                                                                                                                 | CW "C" morse code — — — —<br>EX: LSB — — — —<br>USB — — — —<br>CW — — — —<br>AM — — — —<br>FM — — — —<br>FSK — — — —<br>LED lights when depressing MODE SW.                                              |
| 5. <b>ENT</b> KEY                                                    | 1) Depress the <b>ENT</b> once.                                                                                                                                                                                   | The frequency display disappears.<br>— — — — —<br>Seven bar's segment and two decimal point displayed.                                                                                                   |
|                                                                      |                                                                                                                                |                                                                                                                                                                                                          |
|                                                                      | 2) Depress MODE/KEY <b>1</b> <b>6</b> <b>7</b> <b>8</b> <b>9</b> <b>ENT</b>                                                                                                                                       | FREQ: 16.7890MHz<br>The "Beeper" sounds simultaneously.                                                                                                                                                  |
| 6. Memory write<br>100 CH memory<br>00—89: NORMAL<br>91—99: SPLIT CH | 1) FREQ: 14.0000MHz<br>MODE: USB<br><b>VFO/M</b> SW: ON                                                                                                                                                           | The frequency displays disappears.<br>M.CH  Two decimal point only<br>M.CH display lights and displays 00 in order. |
|                                                                      | 2) Repeat <b>VFO/M</b> SW: ON                                                                                                                                                                                     | FREQ: 14.0000MHz<br>The "Beeper" sounds simultaneously.                                                                                                                                                  |
|                                                                      | 3) <b>M.IN</b> SW: ON                                                                                                                                                                                             | The frequency display disappears.<br>M.CH display lights and displays 00 in order.<br>M.SCR LED light.                                                                                                   |
|                                                                      | 4) <b>M.IN</b> SW: ON again                                                                                                                                                                                       | FREQ: 14.0000MHz<br>(Memory is written already)                                                                                                                                                          |
|                                                                      | 5) <b>VFO/M</b> SW: ON                                                                                                                                                                                            | FREQ 14.0000 MHz<br>M.CH display lights and displays 00 in order.                                                                                                                                        |

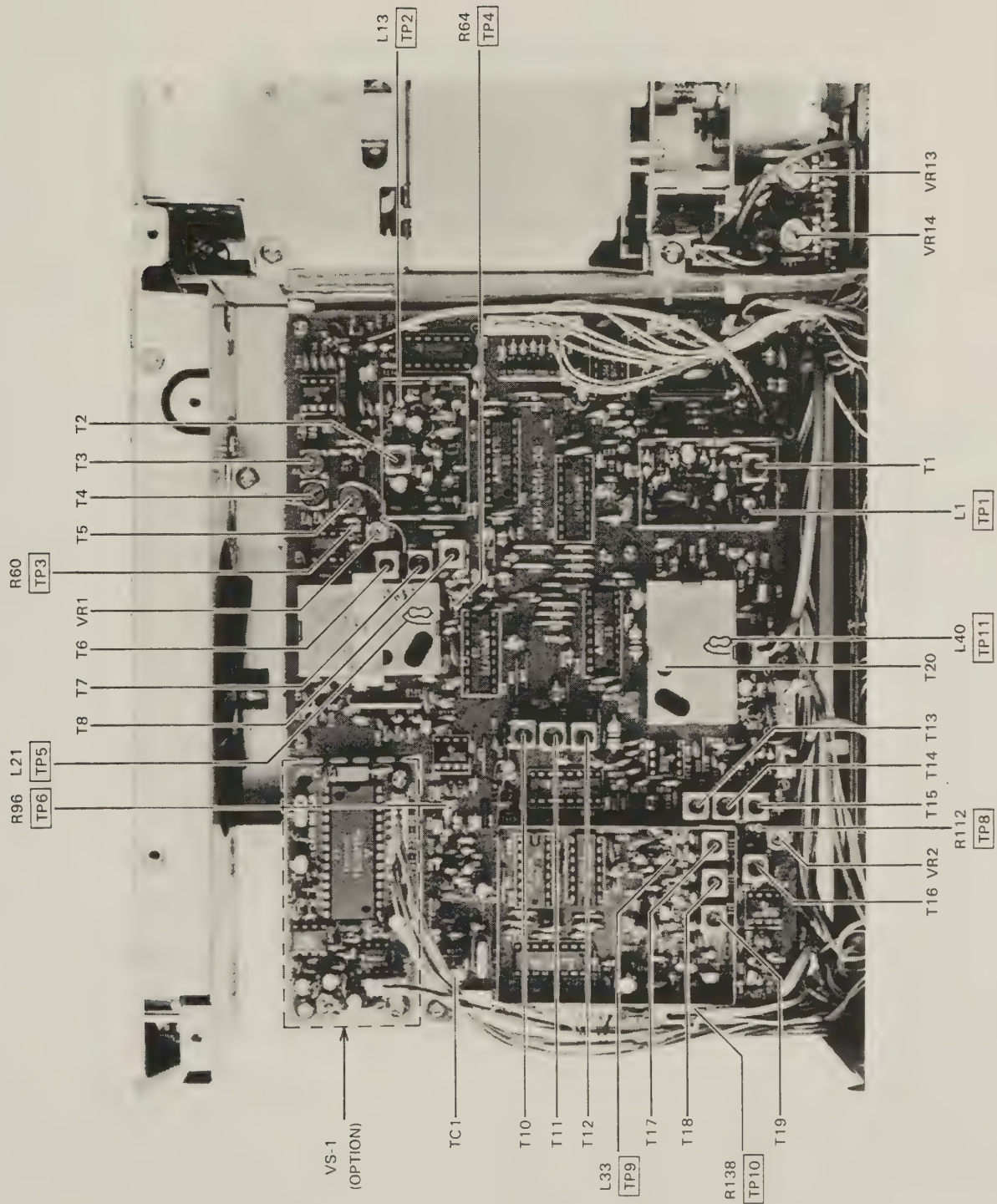
## ADJUSTMENT

TOP VIEW



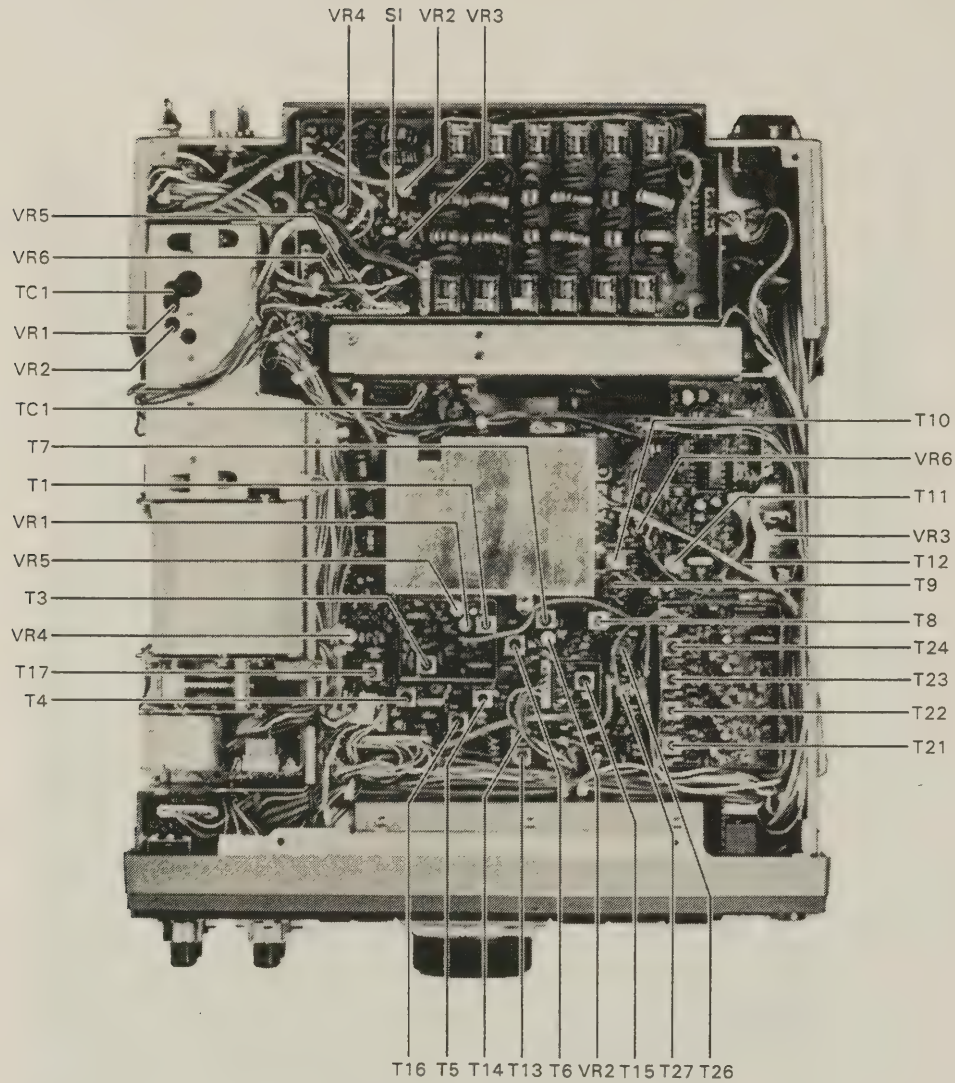
## ADJUSTMENT

## INNER VIEW



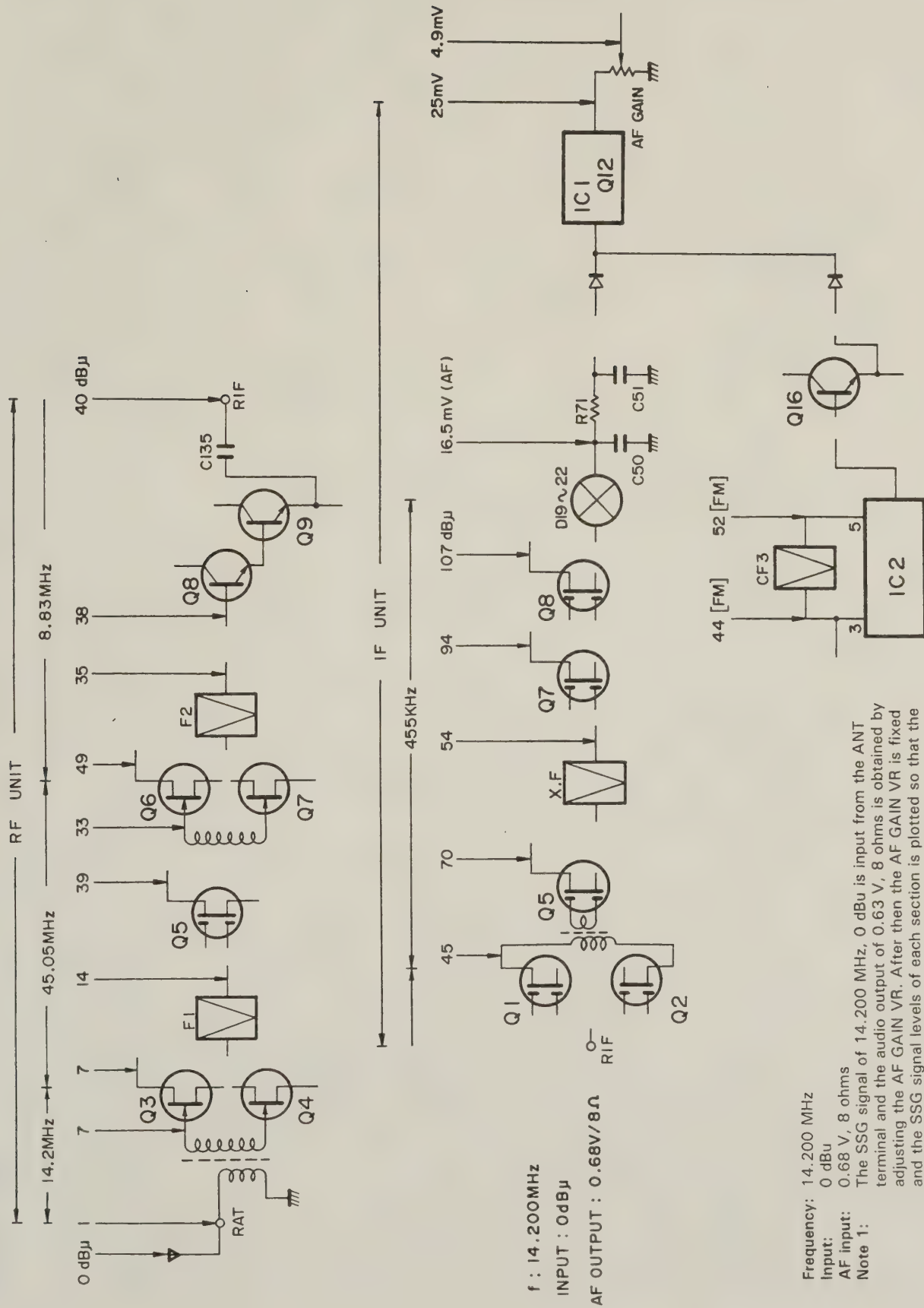
## ADJUSTMENT

### BOTTOM VIEW



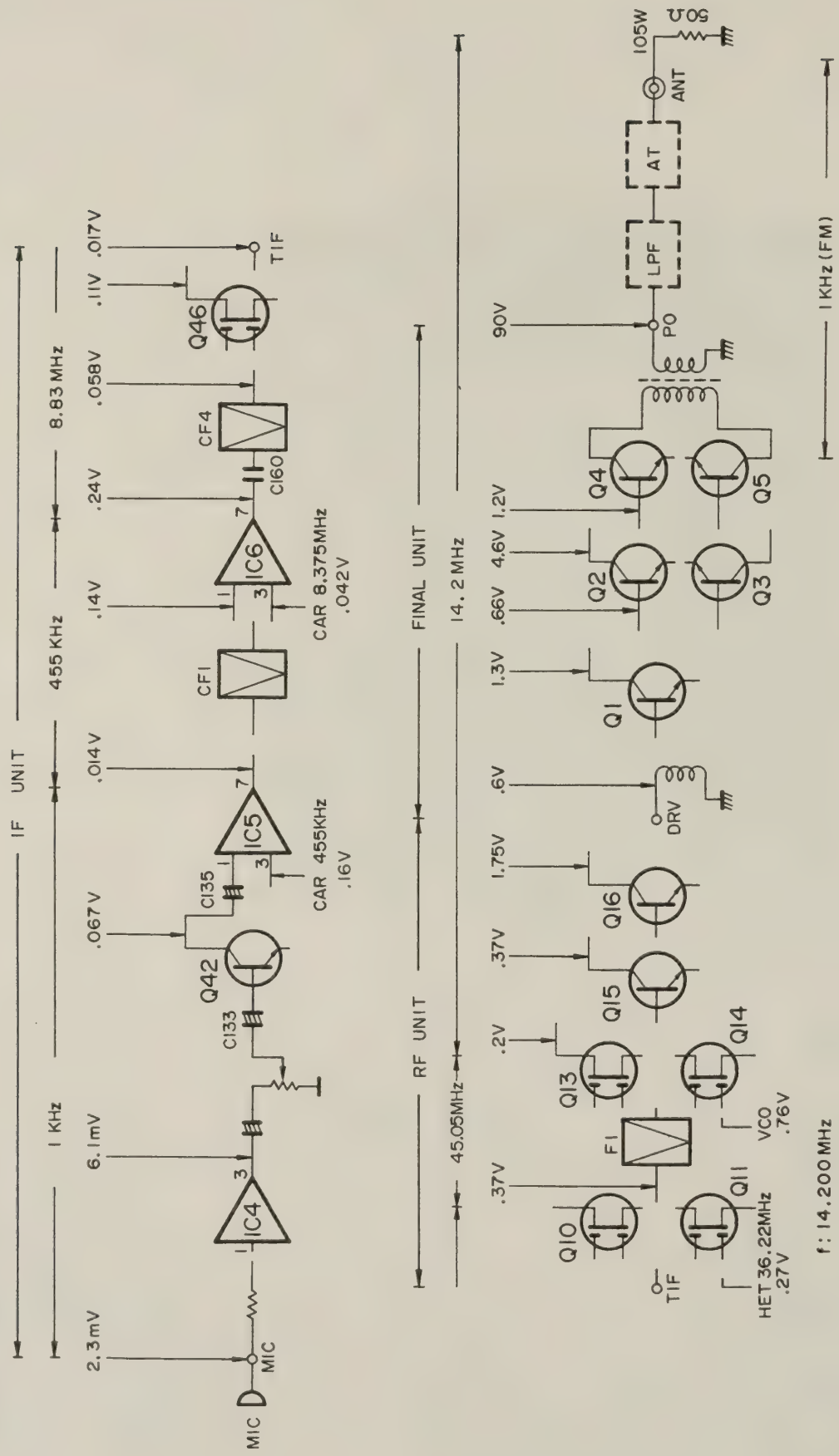
## LEVEL DIAGRAM

## RX SECTION



LEVEL DIAGRAM

TX SECTION



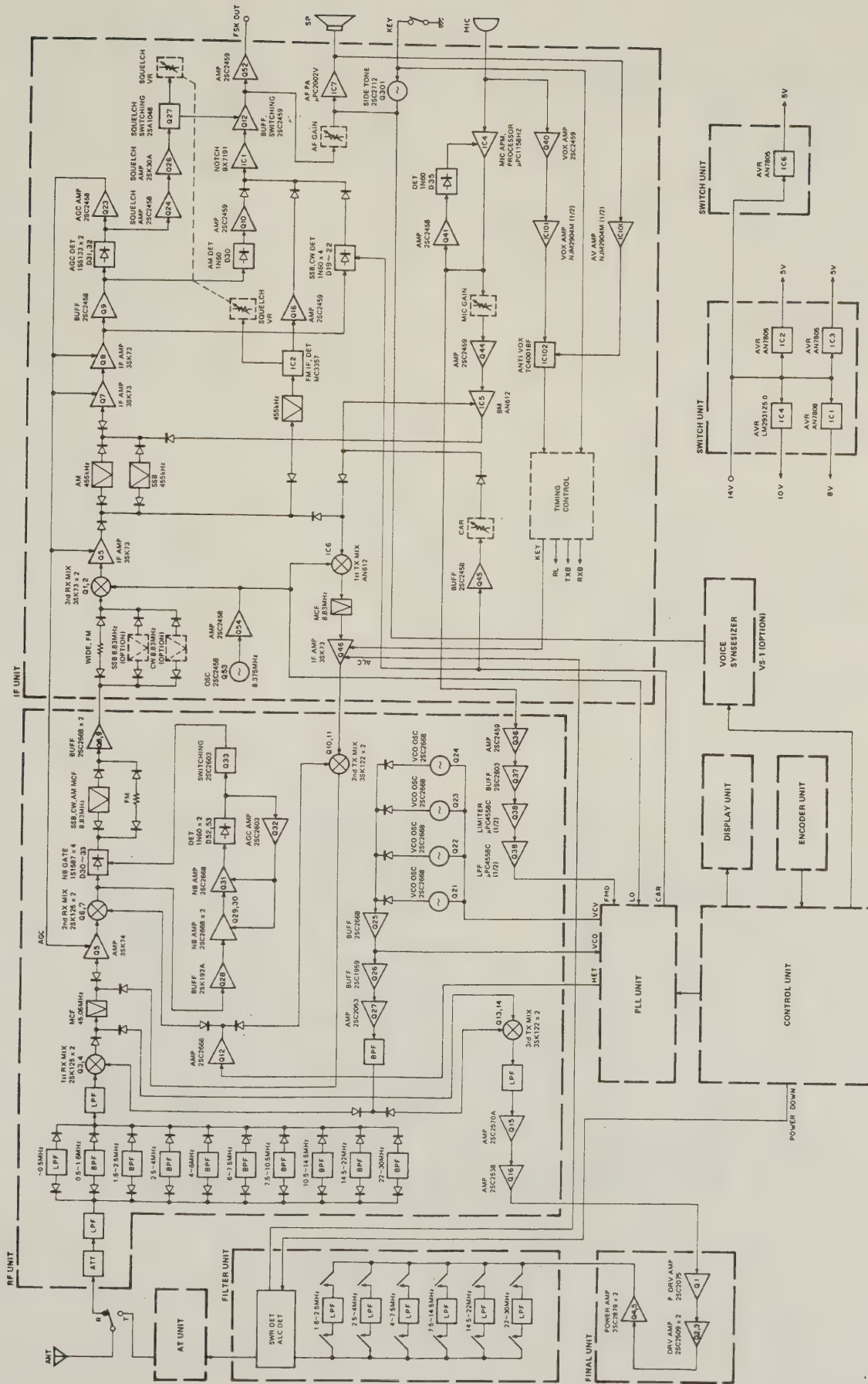
Frequency: 14.200 MHz

Note 1: The high frequency section is measured by the RF valve voltmeter in the CW mode, and the low frequency section is measured using the AF valve voltmeter in the USB mode to obtain this value.

Note 2: The value of the audio input signal is obtained by the 1 kHz single tone which measures almost full scale within the ALC zone of the meter in the USB mode or standard modulation ( $\pm 3$  kHz, dev.) in the FM mode.

Note 3: Set the MIC VR to its maximum level position.

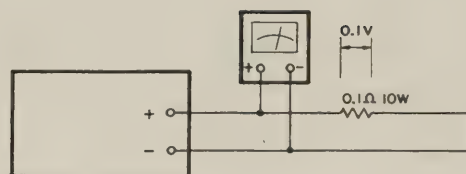
## BLOCK DIAGRAM



## ADJUSTMENT

### 1. OUTPUT VOLTAGE

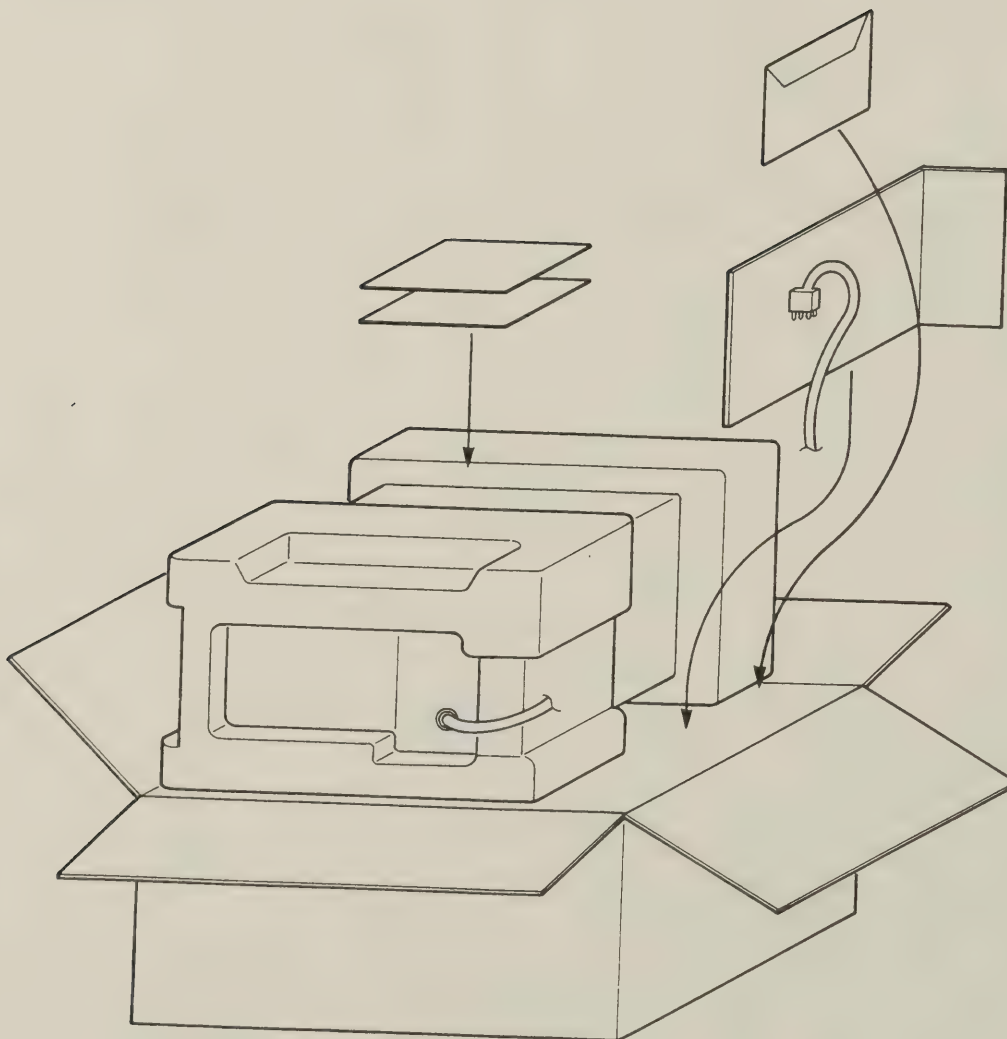
- 1) Connect the load and set the current to 20A.
- 2) Adjust output voltage to  $13.8 \text{ V} \pm 0.4 \text{ V}$  with VR1.



### 2. PROTECTION CIRCUIT

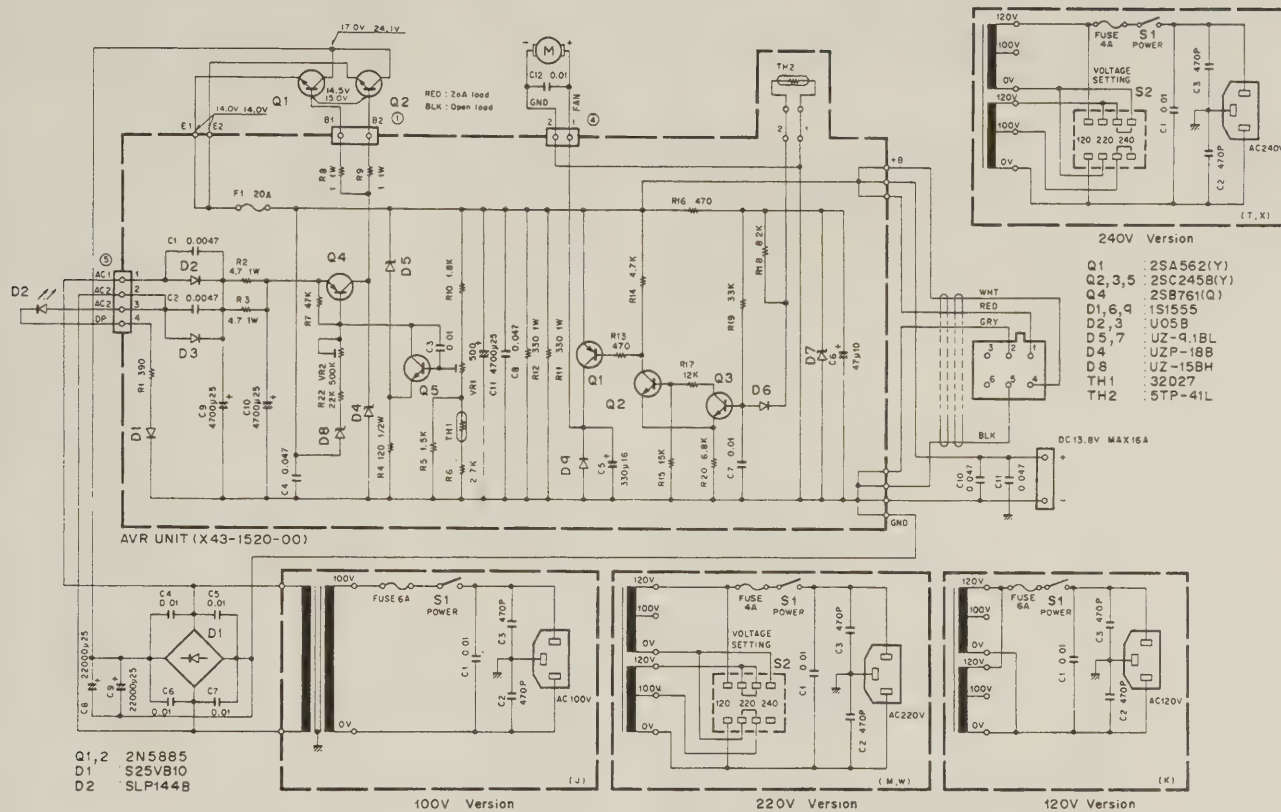
- 1) POWER SW: OFF
- 2) Connect a  $0.1 \Omega$  10 W resistor.
- 3) POWER SW: ON
- 4) Adjust VR2 so that 0.1V DC is obtained.

## PACKING

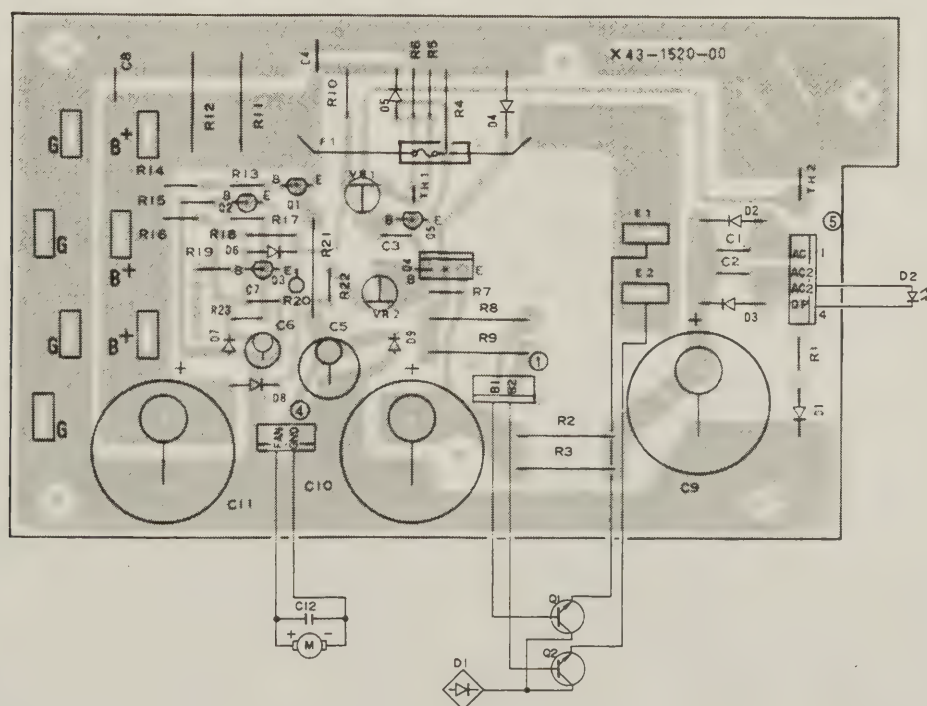


## SCHEMATIC DIAGRAM/PC BOARD

### SCHEMATIC DIAGRAM (X43-1520-00)



PC BOARD VIEW (X43-1520-00) AVR UNIT Component side view



## PARTS LIST

\* New Parts

Parts without Parts No. are not supplied.

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## PARTS LIST

| Ref. No.<br>参照番号 | Address<br>位置 | New<br>Parts<br>新 | Parts No.<br>部品番号 | Description<br>部品名 / 規格        | Desti-<br>nation<br>仕向 | Re-<br>marks<br>備考 |
|------------------|---------------|-------------------|-------------------|--------------------------------|------------------------|--------------------|
| PS-50            |               |                   |                   |                                |                        |                    |
| -                |               | *                 | A01-1000-02       | CASE (UPPER)                   |                        |                    |
| -                |               | *                 | A01-1001-12       | CASE (LOWER)                   |                        |                    |
| -                |               | *                 | A01-1002-12       | CASE (LOWER)                   |                        |                    |
| -                |               | *                 | A20-2561-03       | PANEL ASSY                     | KMW                    |                    |
| -                |               | *                 | A20-2561-03       | PANEL ASSY                     | X                      |                    |
| -                |               | *                 | A20-2562-03       | PANEL ASSY                     | T                      |                    |
| -                |               | *                 | A23-1491-03       | REAR PANEL                     |                        |                    |
| -                |               | *                 | B40-3640-04       | MODEL NAME PLATE               | K                      |                    |
| -                |               | *                 | B40-3641-04       | MODEL NAME PLATE               | MWX                    |                    |
| -                |               | *                 | B40-3642-04       | MODEL NAME PLATE               | T                      |                    |
| -                |               |                   | B41-0627-14       | CAUTION LABEL (220V)           | MW                     |                    |
| -                |               |                   | B41-0630-04       | CAUTION LABEL (240V)           | TX                     |                    |
| -                |               |                   | B42-1733-14       | CAUTION LABEL (120V/220V/240V) | MTW                    |                    |
| -                |               |                   | B42-1733-14       | CAUTION LABEL (120V/220V/240V) | X                      |                    |
| -                |               |                   | B42-1770-04       | LABEL (FUSE, 4A)               | MTW                    |                    |
| -                |               |                   | B42-1770-04       | LABEL (FUSE, 4A)               | X                      |                    |
| -                |               | *                 | B42-2430-04       | CAUTION LABEL (120V)           | K                      |                    |
| -                |               |                   | B46-0411-00       | WARRANTY CARD                  | K                      |                    |
| -                |               | *                 | B50-8051-00       | INSTRUCTION MANUAL             | KMW                    |                    |
| -                |               | *                 | B50-8051-00       | INSTRUCTION MANUAL             | X                      |                    |
| -                |               | *                 | B50-8052-00       | INSTRUCTION MANUAL             | T                      |                    |
| C1               |               |                   | C91-0647-05       | CERAMIC 0.01UF P               |                        |                    |
| C2 ,3            |               |                   | C91-0496-05       | CERAMIC 470PF K                |                        |                    |
| C4 -7            |               |                   | CK45E2H103P       | CERAMIC 0.010UF P              |                        |                    |
| C8 ,9            |               | *                 | C90-2034-05       | ELECTRON 22000UF 25WV          |                        |                    |
| C10 ,11          |               |                   | CK45F1H473Z       | CERAMIC 0.047UF Z              |                        |                    |
| C12              |               |                   | CK45F1H103Z       | CERAMIC 0.010UF Z              |                        |                    |
| -                |               |                   | E18-0351-05       | SOCKET                         |                        |                    |
| -                |               |                   | E20-0283-05       | TERMINAL BOARD                 |                        |                    |
| -                |               |                   | E30-1639-05       | AC POWER CORD                  |                        |                    |
| -                |               |                   | E30-1643-15       | AC POWER CORD                  | KM                     |                    |
| -                |               |                   | E30-1644-15       | AC POWER CORD                  | T                      |                    |
| -                |               |                   | E30-1645-05       | AC POWER CORD                  | W                      |                    |
| -                |               |                   | E30-1647-05       | AC POWER CORD                  | X                      |                    |
| -                |               |                   | F01-0939-03       | HEAT SINK                      |                        |                    |
| -                |               |                   | F05-4022-05       | FUSE (4A)                      | MTW                    |                    |
| -                |               |                   | F05-4022-05       | FUSE (4A)                      | X                      |                    |
| -                |               |                   | F05-6021-05       | FUSE (6A)                      |                        |                    |
| -                |               |                   | F09-0410-04       | HEAD PROTECTOR (FAN)           |                        |                    |
| -                |               |                   | G02-0549-04       | LEAF SPRING                    |                        |                    |
| -                |               | *                 | H01-4693-04       | ITEM CARTON BOX                | KMW                    |                    |
| -                |               | *                 | H01-4693-04       | ITEM CARTON BOX                | X                      |                    |
| -                |               | *                 | H01-4694-04       | ITEM CARTON BOX                | T                      |                    |
| -                |               |                   | H03-2281-04       | CARTON BOX (OUTSIDE)           |                        |                    |
| -                |               |                   | H10-2567-02       | POLYSTYRENE FOAMED FIXTURE (F) |                        |                    |
| -                |               |                   | H10-2568-02       | POLYSTYRENE FOAMED FIXTURE (R) |                        |                    |
| -                |               | *                 | H12-1389-04       | PACKING FIXTURE                |                        |                    |
| -                |               | *                 | H20-1430-03       | PROTECTION COVER               |                        |                    |
| -                |               |                   | H25-0105-04       | PROTECTION BAG                 |                        |                    |
| -                |               |                   | J02-0323-05       | FOOT (F)                       |                        |                    |

## PARTS LIST

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|--------------------|---------------|-------------------|-------------------|----------------------------|------------------------|--------------------|
| -                  |               |                   | J02-0442-04       | FOOT (R)                   |                        |                    |
| -                  |               |                   | J02-0443-04       | FOOT (/3.2)                |                        |                    |
| -                  |               |                   | J13-0033-15       | FUSE HOLDER                |                        |                    |
| -                  |               |                   | J21-4153-14       | MOUNTING HARDWARE(MOTOR)   |                        |                    |
| -                  |               | *                 | J21-4179-04       | MOUNTING HARDWARE(ELECTRO) |                        |                    |
| -                  |               |                   | J21-4180-03       | MOUNTING HARDWARE(FAN)     |                        |                    |
| -                  |               | *                 | J21-4181-14       | MOUNTING HARDWARE(P.T)     |                        |                    |
| -                  |               | *                 | J30-0542-04       | SPACER                     |                        |                    |
| -                  |               |                   | J42-0403-05       | POWER CORD BUSHING         |                        |                    |
| -                  |               |                   | J61-0408-05       | WIRE BAND                  |                        |                    |
| -                  |               |                   | K29-0758-04       | PUSH KNOB                  |                        |                    |
| -                  |               |                   | L01-8286-05       | POWER TRANSFORMER          |                        |                    |
| -                  |               |                   | N09-0256-05       | SCREW                      |                        |                    |
| -                  |               |                   | N09-0658-04       | SCREW                      |                        |                    |
| -                  |               |                   | N10-2030-46       | HEXAGON NUT                |                        |                    |
| -                  |               |                   | N15-1030-46       | FLAT WASHER                |                        |                    |
| -                  |               |                   | N30-2604-46       | PAN HEAD MACHINE SCREW     |                        |                    |
| -                  |               |                   | N30-3014-46       | PAN HEAD MACHINE SCREW     |                        |                    |
| -                  |               |                   | N30-4016-46       | PAN HEAD MACHINE SCREW     |                        |                    |
| -                  |               |                   | N33-3006-41       | OVAL HEAD MACHINE SCREW    |                        |                    |
| -                  |               |                   | N35-3006-41       | BINDING HEAD MACHINE SCREW |                        |                    |
| -                  |               |                   | N35-3008-41       | BINDING HEAD MACHINE SCREW |                        |                    |
| -                  |               |                   | N87-3006-41       | BRAZIER HEAD TAPTITE SCREW |                        |                    |
| -                  |               |                   | N87-3006-46       | BRAZIER HEAD TAPTITE SCREW |                        |                    |
| -                  |               |                   | N87-3012-45       | BRAZIER HEAD TAPTITE SCREW |                        |                    |
| -                  |               |                   | N87-3014-46       | BRAZIER HEAD TAPTITE SCREW |                        |                    |
| -                  |               |                   | N88-3008-46       | FLAT HEAD TAPTITE SCREW    |                        |                    |
| S1                 |               |                   | S40-1405-05       | PUSH SWITCH (POWER)        | MTWX                   |                    |
| S2                 |               |                   | S29-2406-05       | ROTARY SWITCH              |                        |                    |
| -                  |               |                   | T42-0302-05       | DC MOTOR ASSY              |                        |                    |
| D1                 |               |                   | SLP144B           | LED                        |                        |                    |
| D1                 |               |                   | S25VB10           | DIODE                      |                        |                    |
| Q1 ,2              |               |                   | 2N5885            | TRANSISTOR                 |                        |                    |
| -                  |               | *                 | X43-1520-00       | POWER SUPPLY PCB ASSY      |                        |                    |
| <b>X43-1520-00</b> |               |                   |                   |                            |                        |                    |
| C1 ,2              |               |                   | CK45E2H472P       | CERAMIC 4700PF P           |                        |                    |
| C3                 |               |                   | CK45F1H103Z       | CERAMIC 0.010UF Z          |                        |                    |
| C4                 |               |                   | CK45F1H473Z       | CERAMIC 0.047UF Z          |                        |                    |
| C5                 |               |                   | CE04W1C331M       | ELECTRO 330UF 16WV         |                        |                    |
| C6                 |               |                   | CE04W1A470M       | ELECTRO 47UF 10WV          |                        |                    |
| C7                 |               |                   | CK45F1H103Z       | CERAMIC 0.010UF Z          |                        |                    |
| C8                 |               |                   | CK45F1H473Z       | CERAMIC 0.047UF Z          |                        |                    |
| C9 -11             |               |                   | C90-0814-05       | ELECTRO 4700UF 25WV        |                        |                    |
| -                  |               |                   | E23-0462-05       | TERMINAL                   |                        |                    |
| MC1                |               |                   | E40-0273-05       | PIN CONNECTOR              |                        |                    |
| MC4                |               |                   | E40-0273-05       | PIN CONNECTOR              |                        |                    |
| MCS                |               |                   | E40-0473-05       | PIN CONNECTOR              |                        |                    |
| F1                 |               |                   | F05-2035-15       | FUSE (20A)                 |                        |                    |
| -                  |               |                   | J42-0428-05       | POWER CORD BUSHING         |                        |                    |

## PARTS LIST

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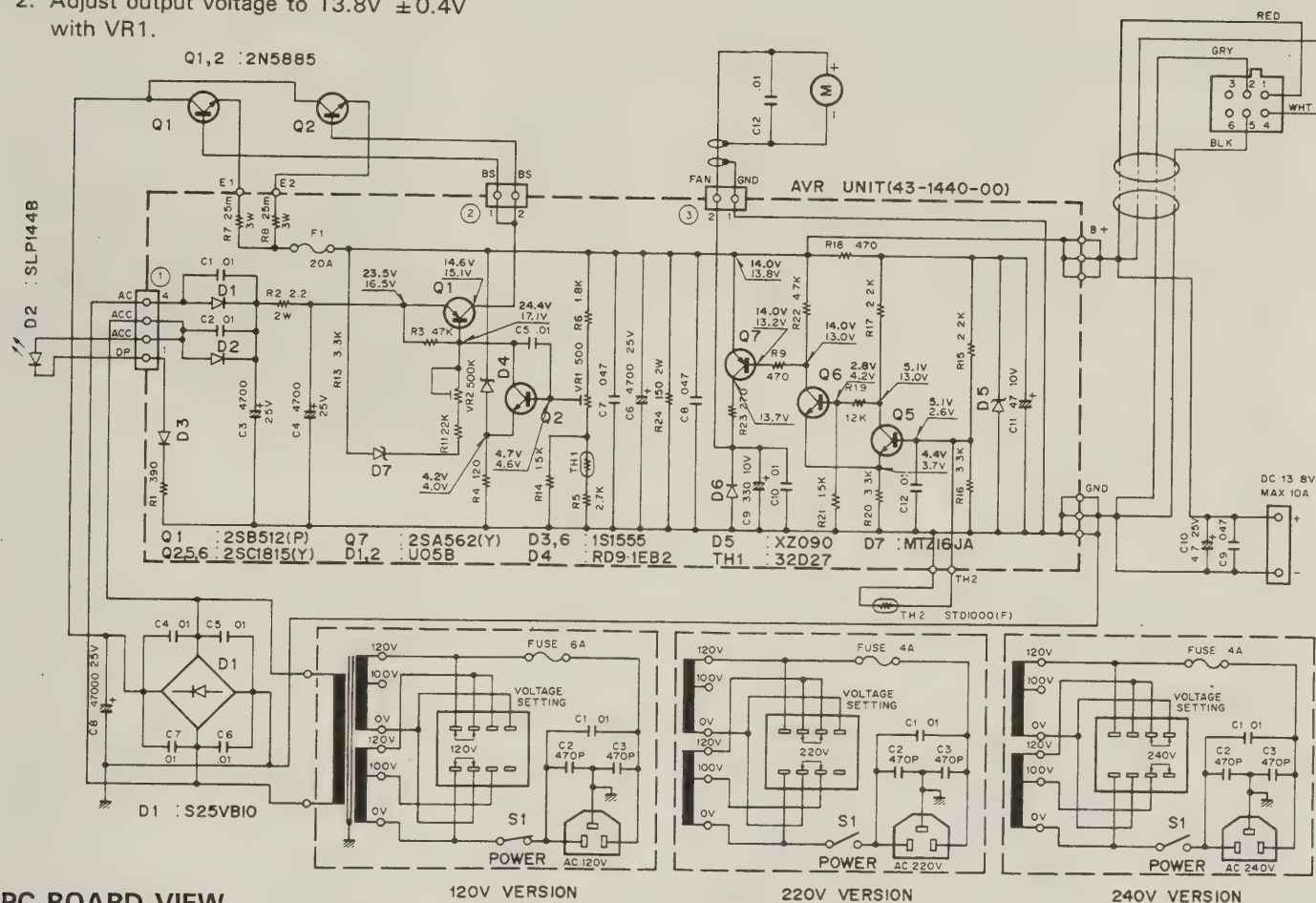
Teile ohne Parts No. werden nicht geliefert.

| Ref. No.<br>参照番号                       | Address<br>位置 | New<br>Parts<br>新 | Parts No.<br>部品番号                                                            | Description<br>部品名 / 規格                                                                                            | Desti-<br>nation<br>仕向 | Re-<br>marks<br>備考 |
|----------------------------------------|---------------|-------------------|------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|------------------------|--------------------|
| R2 ,3<br>R4<br>R8 ,9<br>R11 ,12<br>R21 |               |                   | RS14GB3A4R7J<br>RD14DB2H121J<br>RS14GB3A010J<br>RS14GB3A331J<br>RS14GB3A151J | FL-PROOF RS 4.7 J 1W<br>SMALL-RD 120 J 1/2W<br>FL-PROOF RS 01 J 1W<br>FL-PROOF RS 330 J 1W<br>FL-PROOF RS 150 J 1W |                        |                    |
| VR1<br>VR2                             |               |                   | R12-1429-05<br>R12-7408-05                                                   | TRIMMING POT. (500)<br>TRIMMING POT. (500K)                                                                        |                        |                    |
| D1<br>D2 ,3<br>D4<br>D5<br>D6          |               |                   | 1S1555<br>U05B<br>UZP18B<br>UZ9.1BL<br>1S1555                                | DIODE<br>DIODE<br>ZENER DIODE<br>ZENER DIODE<br>DIODE                                                              |                        |                    |
| D7<br>D8<br>D9<br>Q1<br>Q2 ,3          |               |                   | UZ9.1BL<br>UZ15BH<br>1S1555<br>2SA562(Y)<br>2SC2458(Y)                       | ZENER DIODE<br>ZENER DIODE<br>DIODE<br>TRANSISTOR<br>TRANSISTOR                                                    |                        |                    |
| Q4<br>Q5<br>TH1<br>TH2                 |               |                   | 2SB761(Q)<br>2SC2458(Y)<br>32D27<br>5TP41L                                   | TRANSISTOR<br>TRANSISTOR<br>THERMISTOR<br>THERMISTOR                                                               |                        |                    |

## SCHEMATIC DIAGRAM/PC BOARD

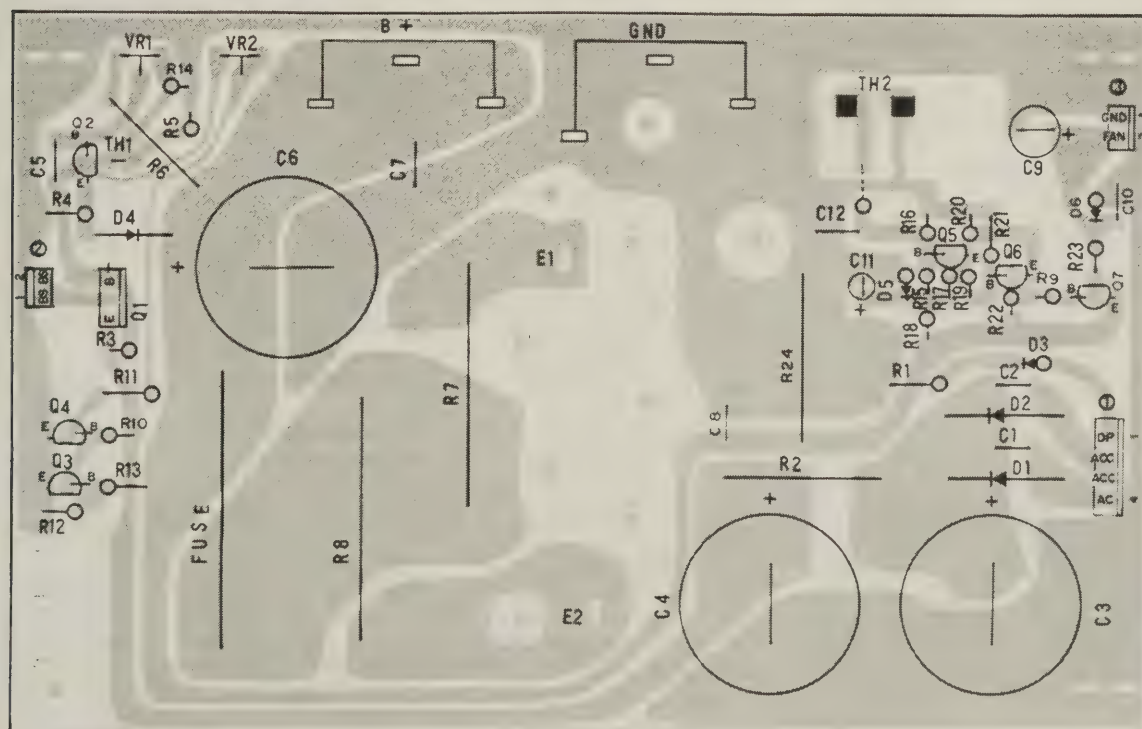
## ADJUSTMENT

1. Connect the load and set the current to 15A.
2. Adjust output voltage to  $13.8V \pm 0.4V$  with VR1.

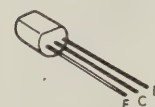


## PC BOARD VIEW

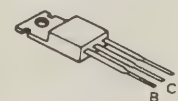
## AVR UNIT (X43-1440-00) Component side view



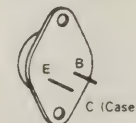
2SC1815



2SB512



2N5885



SLP-144B



## SPECIFICATIONS/PARTS LIST

## SPECIFICATIONS

|                                    |                                                                                                                                                                      |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Input voltage:</b>              | 120/220/240V AC±10%, 50/60 Hz                                                                                                                                        |
| <b>Output voltage:</b>             | 13.8V DC (standard voltage)                                                                                                                                          |
| <b>Output current:</b>             | 20 A (25% duty cycle) 15A (50% duty cycle)                                                                                                                           |
| <b>Continuous load current:</b>    | 10 A max. (including external output terminal)                                                                                                                       |
| <b>Output voltage fluctuation:</b> | Within ±0.7 V at AC 120V, 220V, 240V±10%<br>(Load current: 15A)<br>Within 0.7 V between 2—15 A load.<br>(No-load output voltage: Less than 16V at 120V/220/240V, AC) |
| <b>Ripple voltage.</b>             | Less than 20 mV (rms) at 13.8V, output current 15A.                                                                                                                  |
| <b>Power consumption:</b>          | Approx. 480 W (at 120/220/240V AC, 13.8V DC, 20A)                                                                                                                    |
| <b>Dimensions:</b>                 | 173 (6-13/16) W x 95 (3-3/4) H x 245 (9-5/8) D mm (inch)                                                                                                             |
| <b>Weight:</b>                     | Approx. 7 kg (15.4 lbs.)                                                                                                                                             |

## PARTS LIST

## SEMICONDUCTOR

N : New parts

| Item               | Re-<br>marks | Name     | Item              | Re-<br>marks | Name       |
|--------------------|--------------|----------|-------------------|--------------|------------|
| <b>Diode</b>       |              | 1S1555   | <b>Thermistor</b> |              | 32D27      |
|                    |              | S25VB10  |                   |              |            |
|                    |              | U05B     | <b>TR</b>         |              | 2N5885     |
| <b>Zener diode</b> |              | RD9.1EB2 |                   |              | 2SB512(P)  |
| <b>LED</b>         |              | SLP144B  |                   |              | 2SC1815(Y) |

| Part No.              | Re-<br>marks | Description              | Ref. No.       |
|-----------------------|--------------|--------------------------|----------------|
| <b>PS-430 GENERAL</b> |              |                          |                |
| A01-0937-02           | N            | Case (upper)             |                |
| A01-0938-12           | N            | Case (lower)             |                |
| A20-2461-03           | N            | Panel                    | <b>K,M,W,X</b> |
| A20-2462-03           | N            | Panel                    | <b>T</b>       |
| B39-0407-04           |              | Spacer x 2               |                |
| B40-2634-04           | N            | Name plate               |                |
| B41-0626-14           | N            | Voltage sheet 120V       | <b>K</b>       |
| B41-0627-14           | N            | Voltage sheet 220V       | <b>M,W</b>     |
| B41-0630-04           | N            | Voltage sheet 240V       | <b>T,X</b>     |
| B42-1733-04           |              | Voltage sheet            |                |
| B42-1770-04           | N            | Current indication sheet | <b>M,T,W,X</b> |
| B46-0404-00           |              | Warranty card            | <b>K</b>       |
| B50-4014-00           | N            | Instruction manual       | <b>K,M,W,X</b> |
| B50-4015-00           | N            | Instruction manual       | <b>T</b>       |
| CE04W1E4R7M           | E            | 4.7 25V                  | C10            |
| CK45E2H103P           | C            | 0.01 500V x 4            | C4-7           |
| CK45F1H473Z           | C            | 0.047 x 2                | C9,11          |
| C90-0865-05           | N            | E 4700 25V               | C8             |
| C91-0079-05           | C            | 0.01                     | C1             |
| C91-0496-05           | C            | 470P x 2                 | C2,3           |
| E18-0351-05           |              | 3P Inlet                 |                |
| E20-0282-05           |              | 2P terminal plate        |                |
| E22-0472-05           |              | Lug plate                |                |
| E23-0015-04           |              | GND lug                  |                |
| E23-0425-05           |              | Lug terminal             |                |
| E30-1643-15           |              | AC cord                  | <b>K,M</b>     |
| E30-1644-15           |              | AC cord                  | <b>T</b>       |

| Part No.    | Re-<br>marks | Description             | Ref. No.       |
|-------------|--------------|-------------------------|----------------|
| E30-1645-05 |              | AC cord                 | <b>W</b>       |
| E30-1647-05 |              | AC cord                 | <b>X</b>       |
| E31-0500-05 |              | Cable with plug         |                |
| F01-0786-03 | N            | Heat sink plate         |                |
| F01-0787-13 | N            | Heat sink               |                |
| F05-4022-05 |              | Fuse 4A                 | <b>K</b>       |
| F05-4022-05 |              | Fuse 4A x 2             | <b>M,T,W,X</b> |
| F05-6021-05 |              | Fuse 6A x 2             | <b>K</b>       |
| F05-6021-05 |              | Fuse 6A                 | <b>M,T,W,X</b> |
| F07-0817-04 | N            | Fan cover               |                |
| F09-0405-24 |              | Fan                     |                |
| H01-4451-04 | N            | Packing carton (inside) | <b>K,M,W,X</b> |
| H01-4452-04 | N            | Packing carton (inside) | <b>T</b>       |
| H10-2567-02 | N            | Packing fixture (F)     |                |
| H10-2568-02 | N            | Packing fixture (R)     |                |
| H12-1319-04 | N            | Cushion                 |                |
| H20-0276-03 |              | Protective cover        |                |
| H25-0105-04 |              | Protective bag          |                |
| J02-0323-05 |              | Foot x 2                |                |
| J02-0427-04 | N            | Assistant foot          |                |
| J13-0033-15 |              | Fuse holder             |                |
| J42-0403-05 |              | Cord bushing            |                |
| J42-0434-05 | N            | Rubber bushing x 3      |                |
| K29-0758-04 |              | Push knob               |                |
| L01-8166-05 | N            | Power transf.           |                |
| S29-2406-05 |              | Voltage selector switch | S2             |
| S40-1404-05 | N            | Power switch            | S1             |
| S59-1407-15 |              | Thermostat              | TM1            |
| T42-0005-15 |              | Fan motor               |                |
| X43-1400-00 | N            | AVR unit                |                |

| Part No.                      | Re-<br>marks | Description        | Ref. No. | Q'ty |
|-------------------------------|--------------|--------------------|----------|------|
| <b>AVR UNIT (X43-1440-00)</b> |              |                    |          |      |
| CE04W1C470M                   | E            | 47 16V             | C9       | 1    |
| CK45F1H103Z                   | C            | 0.01               | C1,2,5   | 3    |
| CK45F1H473Z                   | C            | 0.047              | C7,8     | 2    |
| C90-0814-05                   | E            | 4700 25V           | C3,4,6   | 3    |
| E23-0022-04                   |              | Terminal           |          | 6    |
| E23-0046-04                   |              | Square terminal    |          | 2    |
| E40-0273-05                   |              | Mini connector 2P  |          | 2    |
| E40-0473-05                   |              | Mini connector 4P  |          | 1    |
| J31-0502-04                   |              | PC board collar    |          | 4    |
| J42-0428-05                   |              | PC board bushing   |          | 4    |
| R12-0427-05                   |              | Trim. pot. 500Ω(B) | VR1      | 1    |
| RS14AB3A181J                  |              | MF 180Ω 1W         | R9       | 1    |
| RS14GB3D4R7J                  |              | MF 4.7Ω 2W         | R2       | 1    |
| R92-0663-05                   | N            | Cement 0.025Ω 3W   | R7,8     | 2    |

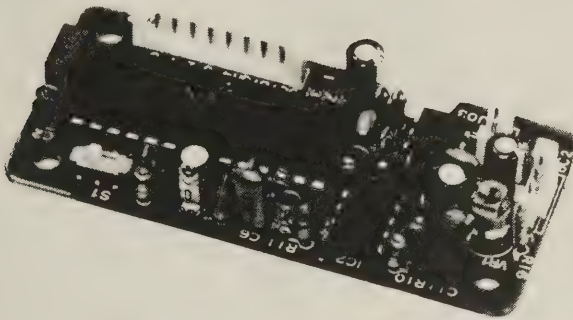
# SPECIFICATION/PARTS LIST/PC BOARD VIEW

## SPECIFICATIONS

**Dimensions:** W 70mm  
H 15mm  
D 35mm

**Weight:** 20g

## OUTSIDE VIEW



## PARTS LIST

| Part No.     | Re-<br>marks | Description             | Ref. No. |
|--------------|--------------|-------------------------|----------|
| B50-4035-00  | N            | Instruction manual      |          |
| CC45SL1H121J | C            | 120P x 2                | C2,3     |
| CE04W1A470M  | E            | 47 10V                  | C1,14,15 |
| CE04W1C100M  | E            | 10 16V                  | C11      |
| CE04W1HR22M  | E            | 0.22 50V                | C12      |
| CK45B1H221K  | C            | 220P x 2                | C7,10    |
| CQ92M1H332K  | ML           | 0.0033 x 3              | C6,8,9   |
| CS15E1E010M  | T            | 1 25V                   | C4       |
| CS15E1V0R1M  | T            | 0.1 35V                 | C5       |
| C91-0131-05  | C            | 0.01 (SP)               | C13      |
| E40-0273-05  | Δ            | Mini connector 2P       | M        |
| E40-0373-05  | Δ            | Mini connector 3P       | M        |
| E40-0373-05  | Δ            | Mini connector x 2 3P   | T        |
| E40-0873-05  | Δ            | Mini connector 8P       |          |
| H01-4481-03  | NΔ           | Packing carton (inside) | M        |
| H01-4501-03  | NΔ           | Packing carton (inside) | T        |
| H25-0029-04  |              | Protective bag x 2      |          |
| L78-0006-05  | N            | Ceramic OSC             | X1       |
| N89-3006-46  |              | Tapping screw x 4       |          |
| R12-4408-05  |              | Trim. pot. 50kΩ         | VR1      |
| S31-1411-05  | N            | Slide switch            | S1       |
| AN6562       | N            | IC                      | IC2      |
| MN6401TRA    | N            | IC                      | IC1      |
| TC40107BP    | N            | IC                      | IC3      |

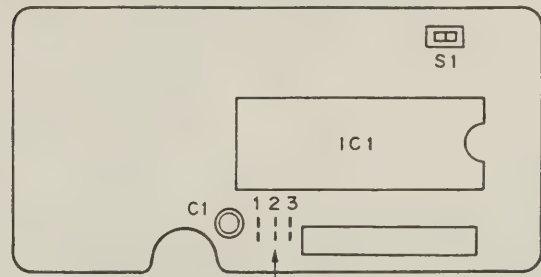
## TALK SPEED SELECTION

Speed is factory set at "standard" talk speed. Three different speeds can be selected.

**Note:** When placing the jumper, solder carefully.

| Speed<br>Jumper place | Std. speed | 30% more<br>than Std. | 60% more<br>than Std. |
|-----------------------|------------|-----------------------|-----------------------|
| 1                     | X          | X                     | O                     |
| 2                     | X          | X                     | O                     |
| 3                     | X          | O                     | X                     |

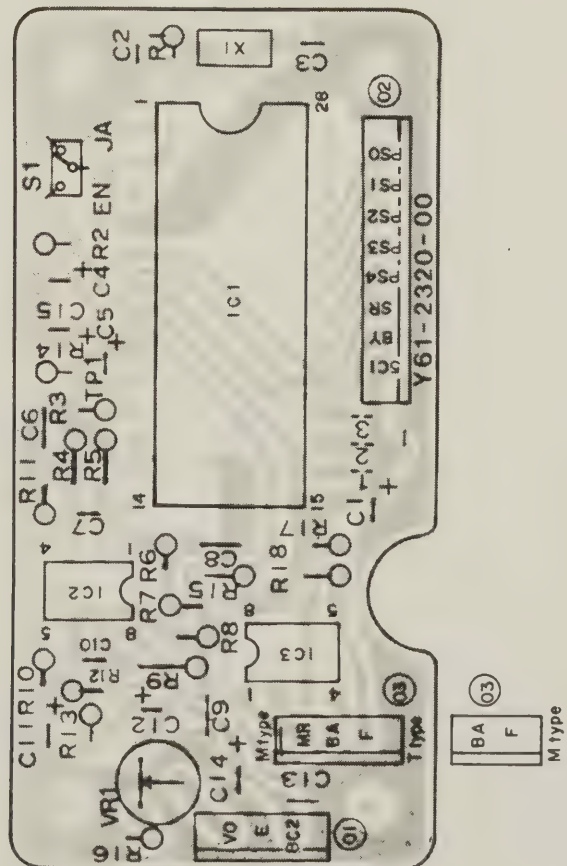
Symbol O, denotes the place in which a jumper wire is placed.



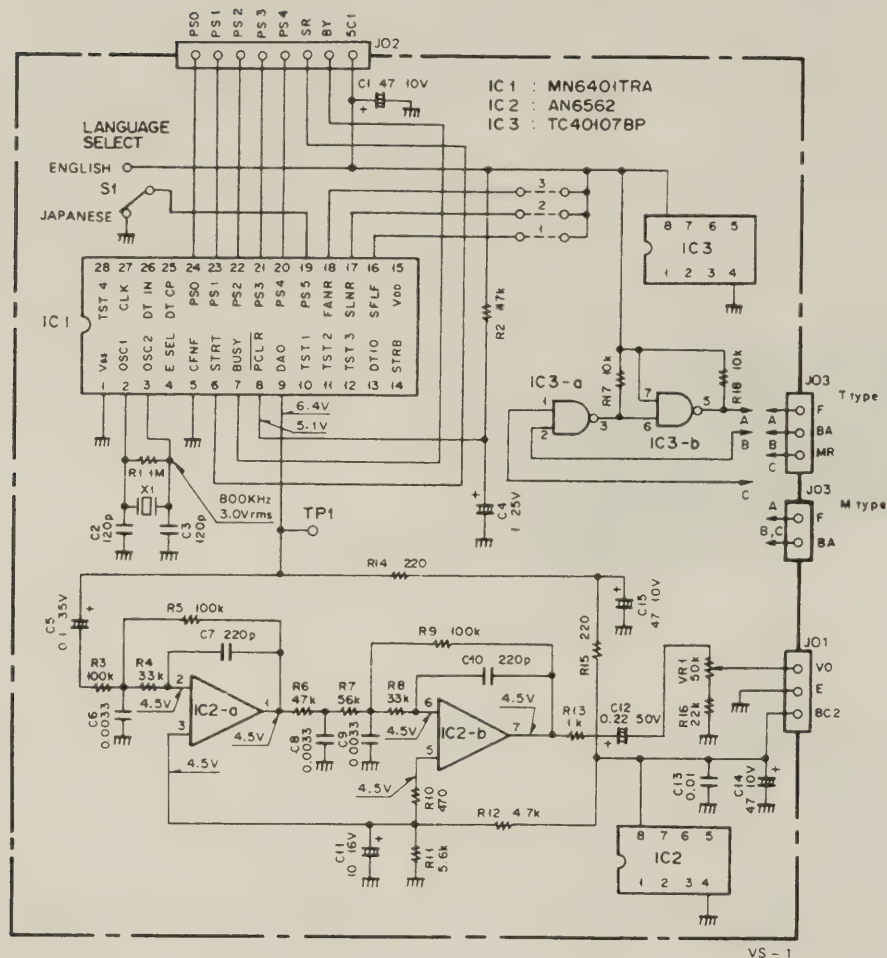
The place which a jumper wire to be placed.

## PC BOARD VIEW

### Component side view



## SCHEMATIC DIAGRAM



# FILTER

## YK-88S

| Item                       | Rating                                                                                            |
|----------------------------|---------------------------------------------------------------------------------------------------|
| Nominal center frequency   | 8830 kHz                                                                                          |
| Center frequency deviation | Within $\pm 150$ Hz at 6 dB                                                                       |
| Pass bandwidth             | $\pm 1.2$ kHz or more at 6 dB                                                                     |
| Attenuation bandwidth      | $\pm 1.5$ kHz or more at 6 dB<br>$\pm 2.2$ kHz or less at 60 dB<br>$\pm 3.0$ kHz or less at 80 dB |
| Ripple                     | 20 dB or less                                                                                     |
| Insertion loss             | 6 dB or less                                                                                      |
| Guaranteed attenuation     | 80 dB or more within<br>$\pm 3$ kHz or 1 MHz                                                      |
| Input and output impedance | 600 $\Omega$ /15 pF                                                                               |

**Table 1 SSB crystal filter YK-88S  
(L71-0208-05) Option**

## YK-88SN

| Item                       | Rating                                                   |
|----------------------------|----------------------------------------------------------|
| Center frequency $f_0$     | 8830 MHz                                                 |
| Center frequency deviation | 8830 kHz $\pm 150$ Hz at 6 dB                            |
| 6 dB bandwidth             | $\pm 900$ Hz or more                                     |
| 60 dB bandwidth            | $\pm 1800$ Hz or less                                    |
| Guaranteed attenuation     | 80 dB or more within<br>$f_0 \pm 2.5$ kHz to $\pm 1$ MHz |
| Ripple                     | 2 dB or less                                             |
| Insertion loss             | 3 dB $\pm 2$ dB                                          |
| Input and output impedance | 600 $\Omega$ /15 pF                                      |

**Table 2 SSB crystal filter YK-88SN  
(L71-0220-05F) Option**

## YK-88C

| Item                       | Rating                                                 |
|----------------------------|--------------------------------------------------------|
| Center frequency $f_0$     | 8830.7 kHz                                             |
| Center frequency deviation | $f_0 \pm 150$ Hz at 6 dB                               |
| 6 dB bandwidth             | $\pm 250$ Hz or more                                   |
| 60 dB bandwidth            | $\pm 900$ Hz or less                                   |
| Ripple                     | 2 dB or less                                           |
| Insertion loss             | 6 dB $\pm 2$ dB                                        |
| Guaranteed attenuation     | 80 dB or more within<br>$f_0 \pm 2$ kHz to $\pm 1$ MHz |
| Input and output impedance | 600 $\Omega$ /15 pF                                    |

**Table 3 CW crystal filter YK-88C  
(L71-0211-05) Option**

## YK-88CN

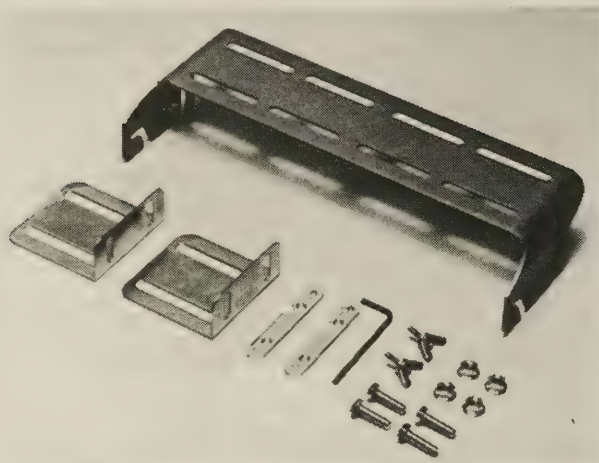
| Item                       | Rating                                                 |
|----------------------------|--------------------------------------------------------|
| Center frequency $f_0$     | 8830.7 kHz                                             |
| Center frequency deviation | $f_0 \pm 50$ Hz at 6 dB                                |
| 6 dB bandwidth             | $\pm 125$ Hz or more                                   |
| 60 dB bandwidth            | $\pm 600$ Hz or less                                   |
| Ripple                     | 2 dB or less                                           |
| Insertion loss             | 8 dB $\pm 2$ dB                                        |
| Guaranteed attenuation     | 80 dB or more within<br>$f_0 \pm 2$ kHz to $\pm 1$ MHz |
| Input and output impedance | 600 $\Omega$ /15 pF                                    |

**Table 4 CW crystal filter YK-88CN  
(L71-0221-05) Option**



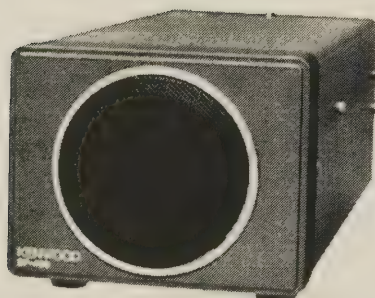
## SPECIFICATIONS/PARTS LIST

### MB-430 OUTSIDE VIEW



### SP-430 SPECIFICATIONS

|                           |                                                                   |
|---------------------------|-------------------------------------------------------------------|
| <b>SPEAKER SIZE</b>       | 3"                                                                |
| <b>RATED INPUT</b>        | 1.0 watts                                                         |
| <b>IMPEDANCE</b>          | 8 ohms                                                            |
| <b>FREQUENCY RESPONSE</b> | 300 Hz to 5 kHz                                                   |
| <b>DIMENSIONS</b>         | 4-7/8" wide x<br>3-3/4" high x<br>9-1/3" deep<br>(excluding feet) |
| <b>WEIGHT</b>             | 3.1 lbs.                                                          |



### SP-430 PARTS LIST

N : New parts

| Part No.    | Re-<br>marks | Description        | Ref. No. |
|-------------|--------------|--------------------|----------|
| A01-0942-03 | N            | Case (B)           |          |
| A01-0944-03 | N            | Case (A)           |          |
| A20-2468-03 | N            | Panel              | K,M      |
| A20-2469-03 | N            | Panel              | T        |
| A23-1431-04 |              | Rear panel         |          |
| B04-0406-04 | N            | SP grill           |          |
| B07-0613-14 |              | SP ring            |          |
| B39-0407-04 |              | Spacer x 2         |          |
| B46-0404-00 |              | Warranty card      | K        |
| B50-4026-00 | N            | Instruction manual | K,M      |
| B50-4027-00 | N            | Instruction manual | T        |

### MB-430 PARTS LIST

N : New parts

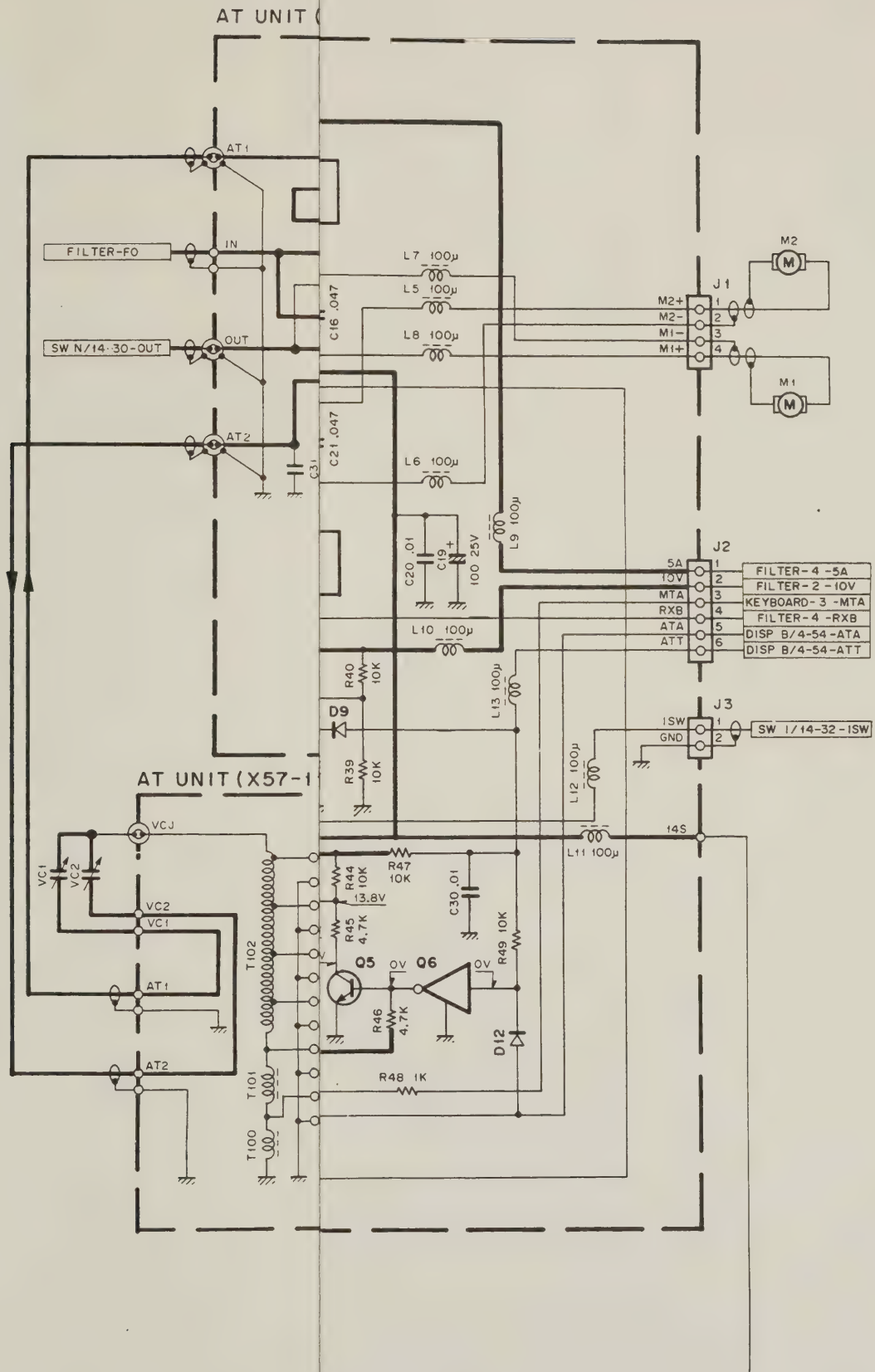
| Part No.    | Re-<br>marks | Description              | Ref. No. |
|-------------|--------------|--------------------------|----------|
| A13-0635-03 | N            | Angle                    |          |
| B50-4016-00 | N            | Instruction manual       |          |
| H01-4454-03 |              | Packing control (inside) |          |
| H25-0077-04 |              | Protective bag           |          |
| H25-0098-04 |              | Protective bag 150 x 480 |          |
| J30-0521-04 | N            | Spacer x 2               |          |
| N09-0007-05 |              | Wing bolt x 5            |          |
| N09-0008-04 |              | Hex. screw x 6           |          |
| N14-0009-04 |              | Nut x 6                  |          |
| N15-1060-46 |              | Flat washer x 6          |          |
| N16-0060-46 |              | Spring washer x 6        |          |
| N32-3006-46 |              | Flat screw x 4           |          |
| N99-0309-04 | N            | Hex. head screw x 6      |          |
| W01-0401-04 |              | Hex. wrench              |          |

| Part No.    | Re-<br>marks | Description                | Ref. No. |
|-------------|--------------|----------------------------|----------|
| E20-0208-04 |              | Terminal plate             |          |
| E30-1629-05 |              | SP cord                    |          |
| G53-0507-04 |              | Packing x 4                |          |
| H01-4468-04 | N            | Packing carton             | K,M      |
| H01-4469-04 | N            | Packing carton             | T        |
| H10-2513-02 |              | Packing fixture (F)        |          |
| H10-2514-12 |              | Packing fixture (R)        |          |
| H12-0445-04 |              | Cushion                    |          |
| H20-1407-03 |              | Protective cover           |          |
| H25-0077-03 |              | Protective bag Accessory   |          |
| J02-0323-05 |              | Foot x 4                   |          |
| J02-0409-04 |              | Assistant foot             |          |
| J21-1144-14 |              | SP mounting hardware x 2   |          |
| J21-2573-04 |              | Foot mounting hardware x 2 |          |
| J61-0019-05 |              | Vinyle tie                 |          |
| N15-1030-46 |              | Washer x 8                 |          |
| N30-3008-46 |              | Round screw x 4            |          |
| N35-3006-41 |              | Bind screw x 12 Case       |          |
| N87-3006-46 |              | Self tapping screw x 6     |          |
| N87-3008-46 |              | Self tapping screw x 4     |          |
| T07-0224-05 | N            | Speaker                    |          |

# TS-440S CIRCUIT D

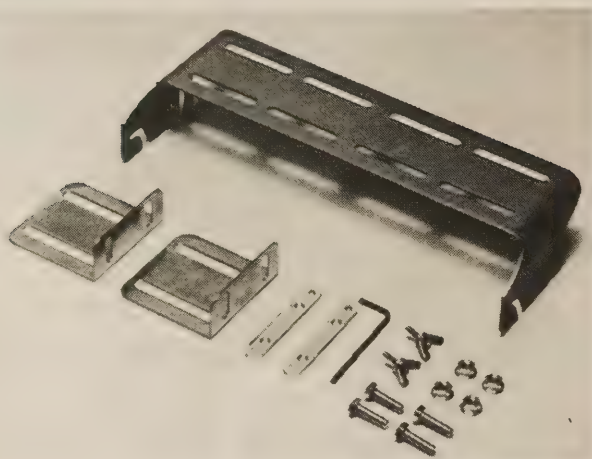
AT UNIT (X57-1150-00)

Refer to Schematic diagram on page 113.



## SPECIFICATIONS/PARTS LIST

### MB-430 OUTSIDE VIEW



### SP-430 SPECIFICATIONS

|                           |                                                                   |
|---------------------------|-------------------------------------------------------------------|
| <b>SPEAKER SIZE</b>       | 3"                                                                |
| <b>RATED INPUT</b>        | 1.0 watts                                                         |
| <b>IMPEDANCE</b>          | 8 ohms                                                            |
| <b>FREQUENCY RESPONSE</b> | 300 Hz to 5 kHz                                                   |
| <b>DIMENSIONS</b>         | 4-7/8" wide x<br>3-3/4" high x<br>9-1/3" deep<br>(excluding feet) |
| <b>WEIGHT</b>             | 3.1 lbs.                                                          |



### SP-430 PARTS LIST

N : New parts

| Part No.    | Re-<br>marks | Description        | Ref. No. |
|-------------|--------------|--------------------|----------|
| A01-0942-03 | N            | Case (B)           |          |
| A01-0944-03 | N            | Case (A)           |          |
| A20-2468-03 | N            | Panel              | K,M      |
| A20-2469-03 | N            | Panel              | T        |
| A23-1431-04 |              | Rear panel         |          |
| B04-0406-04 | N            | SP grill           |          |
| B07-0613-14 |              | SP ring            |          |
| B39-0407-04 |              | Spacer x 2         |          |
| B46-0404-00 |              | Warranty card      | K        |
| B50-4026-00 | N            | Instruction manual | K,M      |
| B50-4027-00 | N            | Instruction manual | T        |

### MB-430 PARTS LIST

N : New parts

| Part No.    | Re-<br>marks | Description              | Ref. No. |
|-------------|--------------|--------------------------|----------|
| A13-0635-03 | N            | Angle                    |          |
| B50-4016-00 | N            | Instruction manual       |          |
| H01-4454-03 |              | Packing control (inside) |          |
| H25-0077-04 |              | Protective bag           |          |
| H25-0098-04 |              | Protective bag 150 x 480 |          |
| J30-0521-04 | N            | Spacer x 2               |          |
| N09-0007-05 |              | Wing bolt x 5            |          |
| N09-0008-04 |              | Hex. screw x 6           |          |
| N14-0009-04 |              | Nut x 6                  |          |
| N15-1060-46 |              | Flat washer x 6          |          |
| N16-0060-46 |              | Spring washer x 6        |          |
| N32-3006-46 |              | Flat screw x 4           |          |
| N99-0309-04 | N            | Hex. head screw x 6      |          |
| W01-0401-04 |              | Hex. wrench              |          |

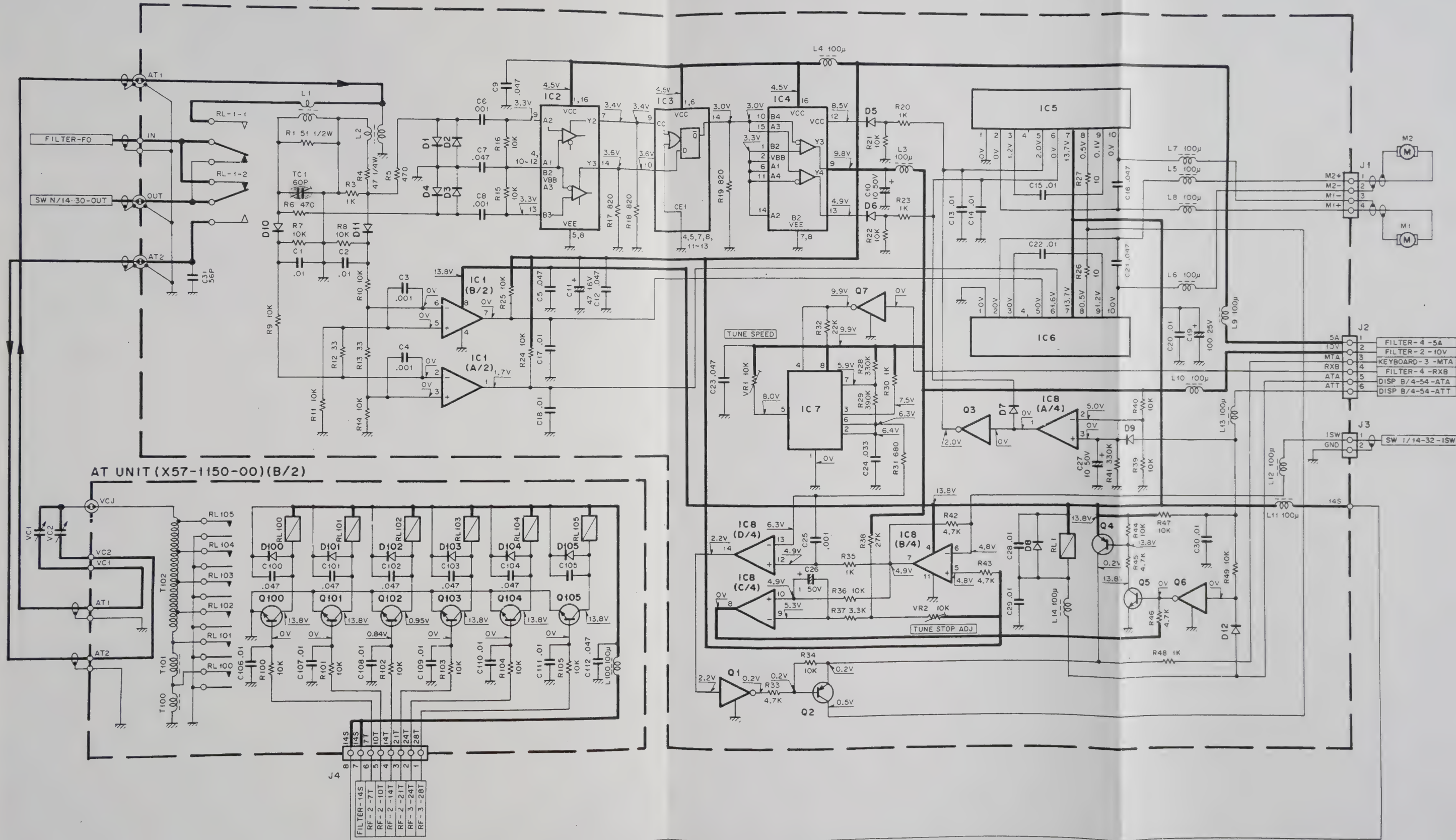
| Part No.    | Re-<br>marks | Description                | Ref. No. |
|-------------|--------------|----------------------------|----------|
| E20-0208-04 |              | Terminal plate             |          |
| E30-1629-05 |              | SP cord                    |          |
| G53-0507-04 |              | Packing x 4                |          |
| H01-4468-04 | N            | Packing carton             | K,M      |
| H01-4469-04 | N            | Packing carton             | T        |
| H10-2513-02 |              | Packing fixture (F)        |          |
| H10-2514-12 |              | Packing fixture (R)        |          |
| H12-0445-04 |              | Cushion                    |          |
| H20-1407-03 |              | Protective cover           |          |
| H25-0077-03 |              | Protective bag Accessory   |          |
| J02-0323-05 |              | Foot x 4                   |          |
| J02-0409-04 |              | Assistant foot             |          |
| J21-1144-14 |              | SP mounting hardware x 2   |          |
| J21-2573-04 |              | Foot mounting hardware x 2 |          |
| J61-0019-05 |              | Vinyle tie                 |          |
| N15-1030-46 |              | Washer x 8                 |          |
| N30-3008-46 |              | Round screw x 4            |          |
| N35-3006-41 |              | Bind screw x 12 Case       |          |
| N87-3006-46 |              | Self tapping screw x 6     |          |
| N87-3008-46 |              | Self tapping screw x 4     |          |
| T07-0224-05 | N            | Speaker                    |          |

# TS-440S CIRCUIT DIAGRAM

AT UNIT (X57-1150-00)

Refer to Schematic diagram on page 113.

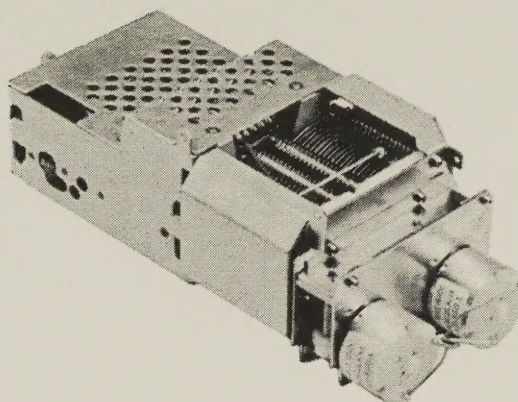
AT UNIT (X57-1150-00) (A/2)



|        |            |           |              |             |            |
|--------|------------|-----------|--------------|-------------|------------|
| IC 1   | : NJM2903D | Q 1,3,6   | : DTC114ES   | D 1~4       | : 1SS99    |
| IC 2   | : HD10116  | Q 2,9     | : 2SA950(Y)  | D 5,6       | : UZ-6.2BL |
| IC 3   | : HD10131  | Q 5       | : 2SC2458(Y) | D 7,9,12    | : 1SS133   |
| IC 4   | : HD10125  | Q 7       | : DTC124ES   | D 8,100-105 | : 1S1555   |
| IC 5,6 | : BA6109U2 | Q 100-105 | : 2SC2668(Y) | D 10,11     | : 1N60     |
| IC 7   | : NE555P   |           |              |             |            |
| IC 8   | : MB3614   |           |              |             |            |



## PARTS LIST



× New Parts

Parts without Parts No. are not supplied.

Les articles non mentionnés dans le Parts No. ne sont pas fournis.

Teile ohne Parts No. werden nicht geliefert.

| Ref. No.<br>参照番号 | Address<br>位置 | New<br>Parts<br>新 | Parts No.<br>部品番号 | Description<br>部品名 / 規格    | Desti-<br>nation<br>仕向 | Re-<br>marks<br>備考 |
|------------------|---------------|-------------------|-------------------|----------------------------|------------------------|--------------------|
| AT-440           |               |                   |                   |                            |                        |                    |
| -                |               |                   | B46-0411-00       | WARRANTY CARD              | K                      |                    |
| -                |               | *                 | B50-8054-00       | INSTRUCTION MANUAL         |                        |                    |
| -                |               | *                 | H01-4695-04       | ITEM CARTON BOX            |                        |                    |
| -                |               | *                 | H03-2283-04       | CARTON BOX (OUTSIDE)       |                        |                    |
| -                |               | *                 | H12-1390-03       | PACKING FIXTURE            |                        |                    |
| -                |               | *                 | H12-1391-04       | PACKING FIXTURE            |                        |                    |
| -                |               |                   | H25-0029-04       | PROTECTION BAG             |                        |                    |
| -                |               |                   | H25-0705-04       | PROTECTION BAG             |                        |                    |
| -                |               |                   | N87-3006-46       | BRAZIER HEAD TAPTITE SCREW |                        |                    |
| -                |               |                   | X57-1150-00       | AT UNIT ASSY               |                        |                    |

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